United States Department of Agriculture
Forest Service

Lakes Basin Project

Final Environmental Assessment

Beckwourth Ranger District, Plumas National Forest, Plumas and Sierra Counties, California

May 2018

Top Left: Gold Lake Highway 1936; Top Right: Historic Location of Gold Lake Highway 2015;
Bottom Left: Gold Lake Lodge circa 1920s (from CSUC Meriam Collection); Bottom Right: Gold Lake Lodge 2015

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Introduction

The Plumas National Forest Beckwourth Ranger District is proposing mechanical thinning, grapple piling, hand thinning, hand-piling, planting of trees, and underburning on 5,463 acres in the Lakes Basin Project. The project activities also include road maintenance, road reconstruction, temporary road construction, and temporary and non-system road obliteration as necessary to meet project access needs and reduce transportation system effects. These actions are proposed to be implemented on public lands on the Beckwourth Ranger District of the Plumas National Forest (PNF). The activities proposed in the Lakes Basin Project aim to promote healthy, diverse, fire-resilient forests, maintain and promote aspen on the landscape, reduce conifer encroachment within meadows, and improve water quality.

Lakes Basin is a unique area on the Plumas National Forest. Past glaciation is responsible for the many sharp peaks and ridges of exposed granite that divide the Basin. The area contains over twenty lakes, ranging from three acres to the 500 acre Gold Lake. Forested habitat ranges from scattered pure pine at the low elevation, through Sierra mixed conifer, up to pure red fir and subalpine forests. In addition, there are large areas of brush, open rocky habitat and talus slopes, wet meadows and riparian areas. The area has an equally high diversity of wildlife ranging from marten habitat in the high elevations, California spotted owl and Northern goshawk, to Sierra Nevada yellow-legged frog habitat within riparian areas.

The Lakes Basin area is a historically significant area which has been utilized by Native Americans to early American settlers. Native Americans utilized the area for its high grade basalt for stone tools which they traded throughout the state of California and beyond. Many of the trails located within the Lakes Basin area were originally Native American trails that are still used today. During the early 1900's the Lakes Basin area was used primarily for gold mining, and logging was active near the town of Graeagle.

The Lakes Basin Recreation Area (LBRA) was established in 1926 by the Secretary of Agriculture, due to the popularity of recreating in the Lakes Basin area (15,376 acres). There are a wide spectrum of recreation opportunities available to Forest visitors within the project area including a combination of developed and semi-primitive camping, resorts with historic lodges, equestrian stables, hiking, mountain bike, and motorized trails.

We prepared this environmental assessment (EA) to determine whether implementation of mechanical thinning, grapple piling, hand thinning, hand-piling, planting of trees, underburning, as well as road maintenance, reconstruction, temporary road construction, and temporary and non-system road obliteration may significantly affect the quality of the human environment and thereby require the preparation of an environmental impact statement. By preparing this EA, we are fulfilling agency policy and direction to comply with the National Environmental Policy Act (NEPA). For more details of the proposed action, see the Proposed Action and Alternatives section of this document.

Proposed Project Location

The project area is located less than one mile southwest of the town of Graeagle, California, on the Beckwourth Ranger District of the Plumas National Forest, Plumas and Sierra Counties, California. The project area includes approximately 12,674 acres of National Forest System lands within and adjacent to the Lakes Basin Recreation Area (LBRA). A significant portion of the project is within the Lakes Basin Management Area (LBMA), with smaller portions of the project within the Mohawk and Haskell Management Areas. The project would encompass all or portions of T22N, R11E, Sec. 36, T22N, R12E, Sec. 21-22, 27-29, 31-34, T21N, R11E, Sec. 1, 12-13, 24, T21N, R12E, Sec. 3-6, 7-10, 15-18, 19-22, 30, Mount Diablo Base Meridian (MDBM).

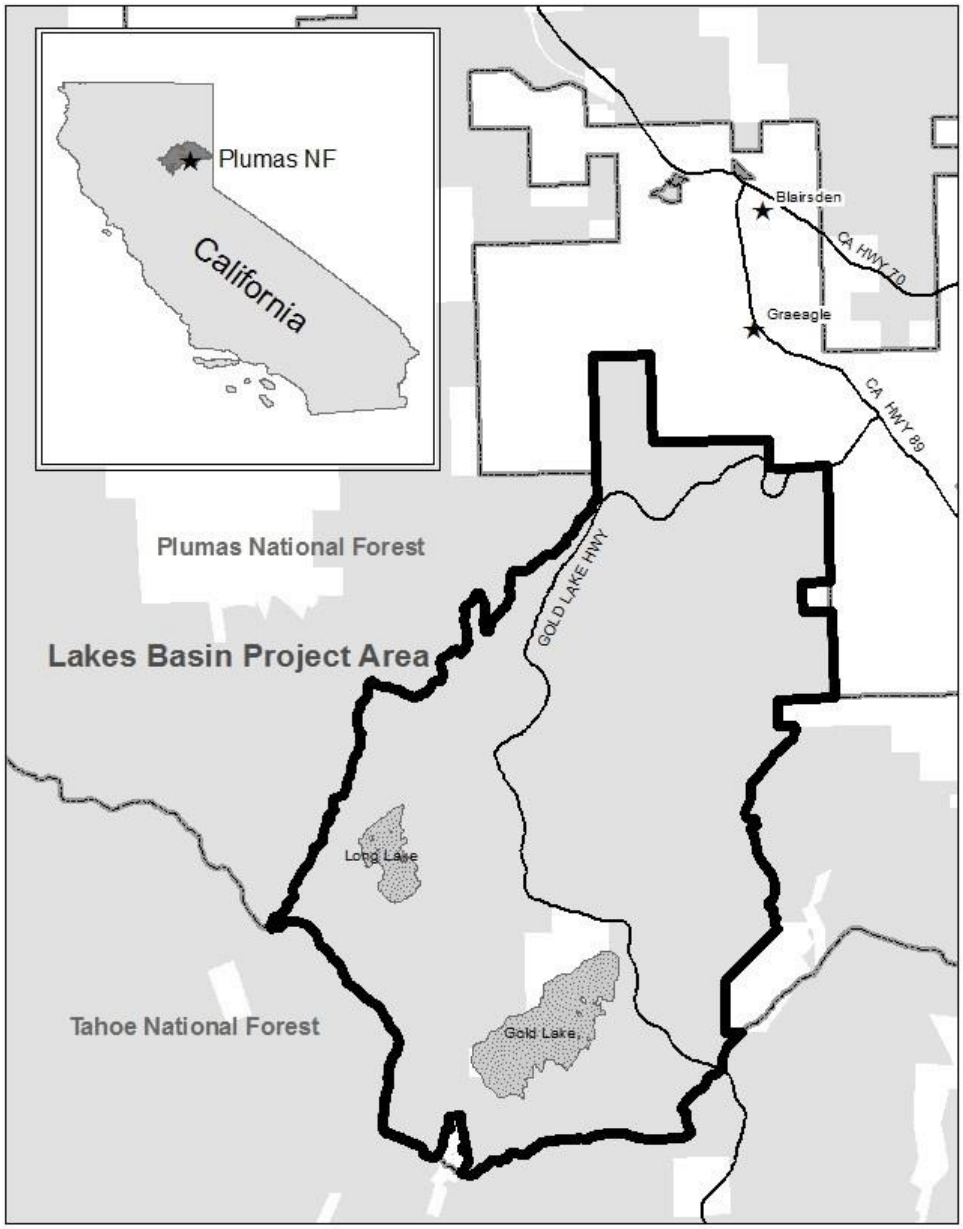

Figure 1. Vicinity map for Lakes Basin Project

Need for the Proposal

The need for action discusses the relationship between the desired condition and the existing condition in order to answer the questions: "Why consider taking any action?" And more specifically: Why *here*? Why *now*?

By regulation, only the need for the proposal must be described in the EA. If choosing to include a distinct purpose statement as well, describe a broad purpose (objective) and specific needs. The purpose and need statement defines the scope and objectives of the proposal, as tied to the programmatic goals of the forest plan. A well-defined purpose and need statement narrows the range of alternatives that may need to be developed in the "alternatives" section. Likewise, the breadth or narrowness of the need for action has a substantial influence in the scope of the subsequent analysis (FSH 1909.15, sec. 41.21).

Purpose and Need 1: Improve forest health and forest resiliency

Objective:

Improve forest health and promote resilience to drought, wildfire, and insects, by:

- Reducing forest stand densities to improve resistance to insects and disease, fire and drought (USDA 2004b, pp. 41, 49, 52).
- Promoting the growth and development of stands with larger diameter trees (USDA 2004b, pp. 41, 49, 52).
- Enhancing species diversity by increasing the proportion of shade-intolerant and/or fire-adapted conifers including ponderosa pine, sugar pine and black oak (USDA 2004b, p. 52).
- Restoring fire-adapted ecosystems out of unnaturally dense conditions (USDA 2004b, p. 34)

Need for Action:

On September 30, 2011 Danny Cluck, Forest Health Protection (FHP) Entomologist conducted a field evaluation of the Lakes Basin area to evaluate current stand conditions. Some of the key findings include: overstocking of trees is putting many stands at risk to high levels of bark beetle caused mortality during periods of drought, several native forest insects and diseases were found throughout the project area contributing to tree mortality including bark beetles and dwarf mistletoe, mixed conifer stands and Jeffrey pine stands have become denser with a higher proportion of white fir in the absence of fire, high fuel loads consisting of an abundance of dead-down trees and dense understory of live trees put many stands at risk to stand-replacing wildfire, and hardwood abundance and health are being negatively impacted by conifer encroachment. (Cluck 2012).

The absence of a natural fire regime and past management practices within the Lakes Basin Project area have changed both vertical and horizontal structure, age class distribution, and

species composition (species composition shift from shade-intolerant to more shade-tolerant species, Cluck 2012) relative to historical forest structure. Shade-tolerant tree species dominate the understory and share the overstory within mixed conifer stands. These understory trees act as ladder fuels by potentially allowing a ground fire to transition into an active crown fire. Increased tree density also means there is more competition for limited resources (water, sunlight, growing space and nutrients). Conifers with limited resources and a high degree of competition often have decreased vigor and growth, especially during drought conditions, and may become more susceptible to insect attack. Many stands within the project area have experienced and may continue to undergo varying levels of mortality associated with high stand densities, drought, insects and diseases. Successive dry years can exacerbate unhealthy stand conditions. This typically results in higher levels of bark beetle caused mortality. Trees that succumb to bark beetle attacks are typically predisposed by other factors that compromise their health and vigor. In the Lakes Basin Project area, high stand density, prolonged drought, dwarf mistletoe and Heterobasidion root disease are all contributing factors (Cluck 2012).

Poor stand health can lead to an increase in dead and dying trees which would contribute to higher hazardous fuel loads. As standing dead trees fall they increase the surface fuel loads which influences surface fire behavior properties (rate of spread, reaction intensity and surface flame length). Standing dead trees not only add to surface fuel loads as they decay and fall, they also pose a hazard to the public within recreation sites (campgrounds, trailheads and lodges) and along travel corridors.

Desired Conditions:

The desired conditions for forest health and forest resiliency would be:

- Increased tree vigor by reducing stand densities leaving residual stands less susceptible to large scale insect/pathogen drought-related disturbances. (USDA 2004b, page 48).
- Forest structure and function generally resembles pre-settlement conditions (USDA 2004b, page 41). A majority of stands are a mosaic, uneven-aged, multi-storied dominated by large, fire-resilient trees. Stands are comprised of three general conditions that would be influenced by ecological and moisture gradients such as topographic position, aspects, and microsites: (1) high density, closed-canopy clumps of trees, (2) openings, (3) and low-mid density areas dominated by large pine trees. Increased regeneration of shade-intolerant pines and hardwood tree species (i.e. ponderosa, sugar pine, and California black oak).
- Maintaining and restoring habitat connectivity within forest types across the landscape (USDA 2004b, pages 31, 53-54).
- Reduced ladder fuels, decrease surface fuel loading, and modify aerial fuels in order to reduce the size and severity of wildlife across the landscape (USDA 2004b, pages 34, 49-50).

Purpose and Need 2: Improve aspen stands and meadow systems

Objective:

Improve aspen growing conditions by releasing aspen stands from conifer competition and promote aspen regeneration. Improve meadow systems by removing conifers that have encroached within meadows.

Need for Action:

Aspen stands within the Lakes Basin Project area are in decline due to conifer encroachment. Aspen is an early-seral, shade-intolerant, disturbance dependent species and reproduces primarily by means of root suckering. Disturbance is necessary to maintain the open habitat required for survival and to stimulate suckers for regeneration. Prior to fire suppression, periodic, low-intensity fires cleared away competing conifers and allowed aspen to maintain its presence.

Both wet and dry meadows located in the Lakes Basin Project area are experiencing varying levels of conifer encroachment. Woody plant invasion may be a response to warming temperatures, reduced snow pack, and fire suppression (Gross et. al. 2013) in addition to human-caused changes to the local hydrological regime (e.g. roads). Field evaluation indicates that, regardless of the relative contribution of these various factors, conifer encroachment is a contributing factor in the spatial decline of meadows within the project area.

Desired Conditions:

The desired conditions for aspen stands and meadow systems would be:

- Restoration of aspen stands towards the range of natural variability (USDA 2004b, page 64).
- Maintain and restore the species composition and structural diversity of plant and animal communities in riparian areas, wetlands, and meadows to provide desired habitats and ecological functions (USDA 2004b, page 32).
- Maintain and restore the connections of floodplains, channels, and water tables to distribute flood flows and sustain diverse habitats (USDA 2004b, page 32).

Purpose and Need 3: Improve Watershed Conditions

Objective:

Protect water quality and riparian habitat by ensuring that existing roads meet Best Management Practices for drainage during rainfall and snowmelt runoff events. Identify roads that degrade water quality and implement corrective actions.

Need for Action:

Roads play a vital role in providing access for resource management, wildland fire suppression, and public access for recreation use. However, unneeded and poorly located roads can impact water quality, disrupt the flow of water and fragment forest habitats. During the travel management planning process (USDA 2010a, b), the routes not added to the National Forest System (NFS) transportation network were not physically closed. These non-system routes are not maintained. Many of them are adversely impacting watershed conditions and thus should be closed or obliterated. The interdisciplinary process for identifying road system needs and roads with resource damage includes a roads analysis consistent with legal requirements (36 CFR 212 Subpart A – Administration of the Forest Transportation System, 16 U.S.C. 551, 23, U.S.C. 205).

Desired Conditions:

The desired conditions for providing the road access needed to meet project objectives while reducing transportation system effects on natural resources would be:

- Access provided for resource management by Forest Service personnel.
- Access for wildland fire suppression.
- Public access for recreation purposes.
- Decreased number of roads that are causing resource damage.
- All NFS system roads and trails comply with the appropriate Best Management Practices.

Laws, Regulations, and Policy that Influence the Scope of this EA

Direction for the Plumas National Forest is based on the 1988 Plumas National Forest Land and Resource Management Plan (commonly referred to as the “Forest Plan”) as amended by the Sierra Nevada Forest Plan Amendment.

In August 1988, the Regional Forester signed the Record of Decision for the Forest Plan. In January 2004, the Regional Forester signed the Sierra Nevada Forest Plan Amendment (SNFPA) final supplemental EIS Record of Decision, which incorporated by reference the 2001 SNFPA Record of Decision. The 2001 SNFPA final EIS and Record of Decision are incorporated by reference in the 2004 Record of Decision on the SNFPA final supplemental EIS. The 2004 Record of Decision on the SNFPA final supplemental EIS directed the Plumas National Forest to implement the HFQLG Pilot Project. When the HFQLG Act expired on September 30, 2012, the Plumas began implementing 2004 SNFPA direction for all projects.

The Recreation Area Prescription does not allow timber harvests, "except as allowed under Pest Management Standard and Guidelines" (USDA 1988a, p. 4-81). The standards and guidelines for Semi-Primitive Area Prescription only allow harvesting timber for "salvage purposes, to remove safety hazards, to construct or improve recreation, or if visual experiences are enhanced. Obtain approval of the Forest Supervisor for any timber harvest. Construct only temporary roads if

needed for salvage operations" (USDA 1988a, p. 4-89). Standards and guidelines for "Forest Pests" allows "control insect and disease epidemic only if significant resources outside the area are threatened or an unnatural, significant loss of recreation value [semi-primitive character] will occur" (USDA 1988a, p. 4-82 and 4-90). Although the PNF LRMP states that no timber harvest shall take place within the Lakes Basin Recreation Area, the Forest Supervisor has discretion to implement timber harvests within the Semi-Primitive Area Prescription land allocation (USDA 1988a, p. 4-89). Coupled with the resources at risk to insect and disease and the potential loss of semi-primitive character and recreation values, the Forest Supervisor deems timber harvesting and mechanical treatments necessary in Recreation Area Prescription and Semi-Primitive Area Prescription (USDA 2016).

For all other land allocations, policy, and regulations, please refer to the Forest Plan, 2004 SNFPA and project record.

Decision to be Made

The Responsible Official for the Lakes Basin Project is the Beckwourth District Ranger based on the anticipated volume of the largest of multiple planned timber sales (USDA 2017e). The Responsible Official would decide whether to implement the Lakes Basin Project as stated in the Proposed Action, as modified by an alternative, or not to implement the project at this time.

Public Involvement and Tribal Consultation

Notice of pending action first appeared in the Plumas National Forest quarterly Schedule of Proposed Actions (SOPA) as the “Lakes Basin Project” in December of 2012, and has been on each subsequent SOPA. The Beckwourth Ranger District held two open house meetings prior to the development of the Proposed Action. Open house meetings were held on June 24, 2015 and June 27, 2015 at the Beckwourth District Office and Graeagle Fire Hall with over 50 individuals attending each meeting. In addition, a public field trip was held on October 29, 2015 which presented the project to members of the public, local stake holders and non-governmental organizations (NGOs). NGOs include Feather River Stewardship Coalition, Plumas County Fire Safe Council, and Sierra Buttes Trail Stewardship. As a result of the comments received during scoping and public meetings, the recreation and trail components of the original proposal were separated out of this project.

The District started the NEPA scoping process with publication in the *Feather River Bulletin* and *Portola Reporter* on December 16, 2015. The purpose of the scoping process was to inform the public about the Purpose and Need and Proposed Action to seek different points of view and to evaluate issues to be addressed during the analysis. The packet was mailed to Native American entities (including federally recognized tribal governments, and Native American organizations/non-profit groups), that are interested in projects located on this portion of the Plumas National Forest. Over 350 Proposed Action description packets (Proposed Action, figures and maps) were sent to various individuals, organizations and government agencies via mail and

electronic mail. The mailing list is contained in the project record and is incorporated by reference.

Comments were received from 11 individuals or organizations (Table 1).

Table 1. Individuals and organizations that provided comments on the Proposed Action

Organization(s)	Representative(s)	Date Received
American Forest Resource Council (AFRC) and Sustainable Forest Action Coalition (SFAC),	Bill Wickman	January 13, 2016
Gold Lake Beach Resort	Jim Reid	January 11, 2016
John Muir Project (JMP) and Center for Biological Diversity (CBD)	Chad Hanson and Justin Augustine	December 18, 2015
Pacific Crest Trail Association (PCTA).	Justin Kooyman	January 13, 2016
Quincy Library Group (QLG)	Bill Wickman and Mike Yost	January 13, 2016
Sierra Forest Legacy (SFL)	Ben Solvesky	December 16, 2015
	Dick Artley	December 30, 2015
	Cary Lynch	December 22, 2015
Plumas Forest Project	John Preschutti	December 31, 2015
Plumas Forest Project	John Preschutti (addendum)	January 6, 2016
Plumas Forest Project	John Preschutti (via CARA)	January 14, 2016
	Mark Mihevc	January 14, 2016
	Mark Mihevc	January 14, 2016
	Todd Vogel	December 16, 2015

Issues and Alternative Development

Issues (cause-effect relationships) serve to highlight effects or unintended consequences of our proposed action. Identifying issues provides us with opportunities to clearly compare trade-offs for the responsible official and the public and reduce potential adverse effects during the analysis (FSH 1909.15 Chapter 12.4). In other words, issues serve to focus the effects analysis and can help to develop proposals to minimize effects.

An issue should be phrased as a cause-effect statement relating the proposed activities to effects. An issue statement should describe a specific action and the anticipated environmental effect(s) of that action. There is no set of standard issues applicable to every proposal, so it is important the responsible official, with the help of the interdisciplinary team, consider applicable laws, regulations, executive orders, and other input. Issues are often grouped by common resources, cause-effect relationship, common geographical area, or a common action. In addition, the issues were used by the interdisciplinary team to study and develop alternatives to the proposed action.

Comments received during public scoping were carefully considered to determine whether the comment contained an issue that should be carried forward into detailed analysis or dismissed

from further consideration. Those carried forward into detailed analysis could become a new alternative or part of a revision to the proposed action.

For an alternative to be analyzed in detail, it must meet the purpose and need for action, must address one or more issues, and address unresolved conflicts related to the proposed action. Reasonable alternatives include those that are practical or feasible from a technical and economic standpoint and use common sense. Alternatives not considered in detail may include, but are not limited to, those that fail to meet the purpose and need, are technologically infeasible or illegal, or would result in unreasonable environmental harm.

The responsible official approved the issues which the interdisciplinary team considered. An explanation of issues being carried forward is included below. An explanation of issues that are not being carried forward are included in Appendix E. The evaluation of the scoping comments is contained in the project record and is incorporated by reference.

Issues Raised During Scoping

Issue 1. Analyze an alternative consistent with California Spotted Owl Interim Recommendations

Commenters are concerned that the proposed action, and more specifically mechanical thinning, would have negative impacts on the California spotted owl habitat and population trends, potentially leading to a trend towards federal listing. Additionally it was suggested that "The Interim Recommendation for Management of California Spotted Owl Habitat on National Forest System Lands" (IRs) should be considered the best available science for maintaining species viability when designing and implementing a timber harvest project. Alternative 2 – The California Spotted Owl Habitat Alternative was developed to comply with the Draft Interim Recommendations for the Management of California Spotted Owl Habitat on National Forest System Lands (USDA 2015).

Issue 2. Exclude mechanical treatment; No mechanical treatment / No mechanical treatment in Lakes Basin Recreation Area

One comment "mechanical thinning…should be dropped because it will by its very nature harm the environment and will not achieve overall, short-, mid-, and long-term resource restoration (aspen and meadow) or fire resiliency as well as hand thinning or underburning alone would." The same commenter suggested that thinning materials up to 6" alone would achieve the removal of the dense understory and ladder fuels resulting in conditions that allow for prescribed fire to be introduced or that result in sending fire to the ground in the event of wildfire. A Hand Thin and Underburn Only Alternative, Alternative 4, was considered but eliminated from detailed study. An explanation is provided in the Alternatives Eliminated from Detailed Study section following the Proposed Action and Alternatives section.

Proposed Action and Alternatives

The proposed action and following alternatives were considered in detail: California Spotted Owl Habitat Alternative, No-Action Alternative. Alternatives that were considered but eliminated from detailed study are described in the Alternatives Eliminated from Detailed Study section below. This follows the Council of Environmental Quality (CEQ) regulations 1502.14 for implementing NEPA, which require the Forest Service to rigorously explore and objectively evaluate all reasonable alternatives and briefly discuss the reasons for eliminating any alternatives. This process was done with resource specialists in an interdisciplinary team (IDT) setting.

Alternative 1 - Proposed Action

The Proposed Action was designed to meet the Purpose and Need discussed above: 1) improve forest health and promote resilience to drought, climate change, wildfire, and insects 2) maintain and promote aspen stands and improve meadow systems and 3) improve watershed conditions in the project area. The Proposed Action treatments include: mechanical thinning, grapple piling, hand thinning, hand-piling, planting of trees, and underburning. Refer to Appendix B Figure 14 and 16 for maps of proposed treatments under Alternative 1.

Table 2. Proposed Treatment Types within the Lakes Basin Project Area.

Treatment Type	Alternative 1	Alternative 2
Wildland Urban Interface (WUI)		
Grapple Pile	72	72
Grapple Pile with Hand Thin	69	69
Hand Thin with Hand Pile	21	111
Hand Thin with Hand Pile -– Meadows	10	10
Hand Thin with Hand Pile -– SNYLF	21	21
Hand Thin with Hand Pile -– Recreation	4	4
Mechanical Thin - VDT	424	334
Mechanical Thin - Aspen	1	1
Mechanical Thin - Recreation	20	20
Underburn Only	54	54
Total WUI	**696**	**696**
General Forest		
Grapple Pile	67	67
Grapple Pile with Hand Thin	47	47
Hand Thin with Hand Pile	245	488
Hand Thin with Hand Pile - Meadows	33	33
Hand Thin with Hand Pile - SNYLF	280	273
Hand Thin with Hand Pile - Recreation	44	44
Hand Thin with Hand Pile - Aspen	32	32
Mechanical Thin - VDT	1,522	1,108
Mechanical Thin - Aspen	38	38

Mechanical Thin - Recreation	109	109
Mechanical Thin – CSO HRCA	N/A	35
No Treatment CSO HRCA	N/A	143
Underburn Only	2,350	2,350
Total General Forest	**4,767**	**4,767**
Total Project Treatment Acres	**5,463**	**5,463**

Note: Acres may vary slightly during the final layout due to topography, stand condition, and rounding, etc.

In addition to project-specific design features and mitigations described with each alternative, the District would implement standard management requirements (SMRs). SMRs represent standard management requirements intended to minimize potential for adverse resource effects (Appendix D). Table 2 lists the proposed treatment type and acres and Table 3 lists the proposed road actions for Alternatives 1 and 2.

Table 3. Summary of road actions proposed in the Lakes Basin Project.

Actions	Miles
Add existing road to National Forest (NF) transportation system	1.2
New temporary road construction	5.0*
Non-system route decommissioning	3.6
Road reconstruction for water quality and product removal	2.2
Road maintenance	7.1

*Up to 5.0 miles proposed, actual construction may be less. Not all temporary roads are mapped at this time. Roads would be obliterated after use.

Treatments to improve forest health and resiliency and reduce fuel loads.

Mechanical Thinning in Wildland Urban Interface (WUI) Defense Zones and General Forest units

Mechanical thinning treatments would include the use of ground-based logging systems on 444 acres in WUI defense zones and 1,631 acres in general forest units. WUI defense zones are primarily situated around the community of Graeagle and the northern end of Gold Lake. Ground-based logging equipment can treat up to 35 percent slope. In general, ground-based logging equipment would remove trees less than 20 inches diameter at breast height (DBH) using whole-tree yarding. Whole-tree yarding involves removal of the entire tree, including tops and main branches to reduce activity fuels accumulation within treatment units. Trees ranging from 20 to <30 inches DBH may be hand felled, bucked to log lengths, limbed, topped, and

skidded to the landing. No trees greater than 30 inches DBH would be removed except in unavoidable cases for operational safety due to Occupational Safety and Health Administration (OSHA) regulations. Project specific design criteria are listed in Tables 5 and 6.

Conifer biomass materials ranging from 3.0 to 9.9 inches DBH would be removed utilizing mechanical thinning. Biomass may be chipped and hauled to a biomass treatment facility, piled at log landings, or piled within treatment units. Mechanical thinning treatments and associated activities would be tailored to achieve Visual Quality Objectives (VQOs) within areas designated by the Forest Plan as visual retention and partial visual retention management prescriptions. Mitigations related to VQOs are described in Table 6.

Variable Density Thinning

Variable density thinning (VDT) is a compilation of various thinning treatment components: a) dense clumps of trees, b) canopy openings where few or no trees exist, c) the matrix – areas between clumps and openings with varying tree densities. Each of these elements is described in more detail in Table 5. Variable density thinning would promote heterogeneity within stands and across the landscape by increasing vertical and horizontal diversity (a mixture of clumps, openings, and matrix). Thinning that produces a more grouped arrangement of trees may be one means of creating heterogeneity at a scale beneficial for wildlife species that prefer different forest structures for nesting, roosting, and foraging, and understory plant species that thrive in different light environments, while simultaneously increasing resilience to wildfire (North 2012). Canopy cover and basal area would be highly variable across treatment units, but would follow the Standards and Guidelines in the Forest Plan, as amended by the 2004 SNFPA ROD. By varying marking guidelines within stands, conflicting prescription objectives such as reducing crown bulk density (canopy density) while maintaining an average target canopy cover can be met (Sherlock 2007). Shade-intolerant, drought-tolerant species would be preferred for retention. Vigorous, disease free and insect free trees would also be kept over declining individuals.

Clumps would have higher tree densities and canopy cover comprised of dominant, codominant and intermediate class trees. Forest surrounding clumps may be thinned to lower residual densities to help reduce potential loss from fire. Where possible, clumps would incorporate trees exhibiting characteristics favorable to wildlife species.

Openings would be created to produce a high-light environment favoring both regeneration of shade-intolerant species and some shrub patches. Some openings would be created by expanding existing openings or low-density areas. Openings may include large pine species that would act as a seed source. If trees are left in gaps, they would ideally be located near the edge or the northern end of the openings to maximize the amount of light available to regenerate pines (North 2012). Tables 5 and 6 display the design criteria associated with mechanical thinning under the Proposed Action.

Residual tree density within the matrix and the placement of clumps and openings would be influenced but not dictated by topography such as slope, slope position, and aspect in addition to microsites (unique topographic features). Table 4 describes topographic and microsite

influences on tree density and distribution (USDA 2012). A majority of those areas where mechanical treatment is proposed within the Lakes Basin Project area occupy northern based aspects. VDT is proposed on approximately 1,946 acres.

Table 4. Topographic and Microsite Influences on Tree Distribution.

Topographic Influences	
Slope Position	Higher densities would occur in drainages, tree densities would decrease mid-slope and decrease further on ridgetop positions.
Slope	Flatter slopes would have higher densities and as slope increases tree densities decrease.
Aspect	Northeastern aspects would support higher densities while southwesterly aspects would have lower densities.
Microsites	
Seeps/Depressions	May support pockets or small groups of higher densities.
Knobs/Areas of Poor Soils	Would sustain lower tree densities.

Where treatment units share a common boundary with meadows, the forest/meadow interface, historic meadow boundaries would be utilized to determine the extent of conifer encroachment and identify meadow buffers. Historic boundaries may be identified by the presence of sparse meadow plants, slope breaks, historic photos or historic aerial photos. Meadow buffers would be measured from the determined historic edge and extend up to a maximum of 50 feet into adjacent forested stands. Within meadow buffers canopy cover would be reduced to 20- 30% to minimize seed sources associated with shade-tolerant tree species. Trees up to 30.0 DBH would be removed. Select tree species (including but not limited to pine species, Douglas-fir, red fir), trees exhibiting old tree characteristics (downward or outward sweeping branches and/or rounding or flat crown apex) or desirable wildlife characteristics would be retained.

Recreation Site Fuels Reduction and Hazard Tree Removal

Approximately 129 acres of recreation sites are proposed for mechanical treatment. Recreation sites include established campgrounds, dispersed campgrounds, lodges, trailheads, and adjacent areas. The primary purpose is to modify fuels (surface, ladder, and crown) and reduce hazard trees within selected recreation sites and adjacent forested stands. Hazard trees greater than 30.0 inches DBH could be removed. Region 5 hazard tree guidelines would be utilized to identify trees which pose a risk to public safety. Also, tree planting is proposed where necessary within established and dispersed recreation sites to replace removed hazard trees or tree mortality associated with insects and disease. Trees proposed for planting include, but are not limited to, Jeffrey pine and western white pine/site appropriate species. Vista points associated with mechanical thinning units along Gold Lake Highway would have view obstructing conifers removed adjacent to the pullouts to re-establish locations utilized for recreational viewing.

Table 5. Design features for mechanical thinning treatments

Criterion	Design Features
Mechanical Thinning Outside WUI Defense Zones (General Forest Stands)	• CWHR types, other than eastside pine, 4M, 4D, 5M, 5D, and 6 • Retain 40% of existing Basal Area. • Avoid reducing canopy cover by more than 30%. • See Table 6 for design features pertaining to VQOs.
VDT Clumps (dense groups of trees)	• Clumps range in size from 1/10th to 1/4th of an acre. • Cover 10-15% of each proposed treatment unit. • Irregular shapes. • Comprised of intermediate to large dominant, codominant trees, preferably shade-intolerant species. • Generally higher basal area and canopy cover than stand "average". • Incorporate wildlife habitat trees (e.g. those with forks, crooks, existing cavities, brooms, nests and snags). • Ladder fuels removed to reduce potential torching. • Desired residual canopy cover >50%.
VDT Openings	• Openings range in size from 1/10th to 1/4 of an acre in size. • Cover 10-15% of each proposed treatment unit. • Expand/enhance existing openings. • Create around/adjacent to shade-intolerant seed sources/legacy trees (trees generally >24" DBH). • Create where healthy, vigorous regeneration of shade-intolerant tree species exists. • Irregular shapes.
VDT Matrix Thinning (areas between clumps and openings)	• Variable spacing and densities. • Healthy, fire resistant shade-intolerant tree species (pine spp., Douglas-fir) within all size class would be preferentially retained with scattered shade-tolerant trees. • Thinning would occur through all size classes < 30" DBH, but would focus on removing suppressed, intermediate, some codominant, and trees of poor health and vigor. • Canopy cover would range from 30-60% (depending on existing conditions), averaging approximately 40-50% across the treatment unit. • Meadow buffers canopy cover would range from 20-30%. • Increased tree removal around fire resistant legacy trees (trees generally >24" DBH) to provide protection from torching. • Release of hardwood species and select shrub species. • Outside of LBRA - Removal of trees ≥30" DBH would occur in areas where mechanical units share a common boundary with meadows (meadow buffers – not to exceed 50 feet from historic meadow edge) to reduce conifer encroachment and seed sources associated with shade-tolerant tree species in addition to unavoidable circumstances regarding operational safety due to Occupational Safety and Health Administration (OSHA) regulations. In such instances Forest Service Representative must approve their removal. • Utilize topographic (slope, aspect, slope position) and microsites in determining tree distribution.
Mechanical Thinning Within WUI Defense Zones	• Utilize VDT design criteria with lower residual canopy cover (30-40%) and residual basal area. • See Table 6 for design features pertaining to VQOs.

Criterion	Design Features
California Spotted Owl and Northern Goshawk Protected Activity Centers (PACs) Buffers	• No mechanical thinning treatment within California spotted owl PACs. • 500 foot radius buffer around Northern goshawk activity centers within the designated PAC where no mechanical treatments would occur. • Canopy cover would average approximately 40-50%. • Higher canopy cover would be retained adjacent to activity centers. • No follow-up underburning in units within activity centers between Gold Lake Highway and Frazier Falls Road.
Mechanical Thin Aspen Stands	• Conifers would be removed within the stand and within the extended treatment zone from the outer most aspen stem, up to 1 ½ times the height of the tallest adjacent conifer. • Trees greater than 30 inches DBH would be removed. • Select conifers (ponderosa pine, Jeffrey pine, sugar pine and Douglas-fir) exhibiting old tree characteristics or desirable wildlife characteristics would be retained. • Fuels would be piled if conditions do not allow for effective underburning. • Temporary fencing to protect new suckers would be considered depending on browsing pressure. • See Table 6 for design features pertaining to VQOs.
Mechanical Thin Recreation Sites (Hazard Trees/Fuels/Inter Plant)	• Remove trees from all diameter classes which are determined to be hazards from within established Forest Service recreation sites. • Mechanical removal of trees up to 30 inches DBH in adjacent stands to reduce fuels and improve visual experiences. • Plant site appropriate trees within established and dispersed recreation sites. • Remove trees less than 30 inches DBH within vista points to increase viewing corridors within Rx8. • See Table 6 for design features pertaining to VQOs.
Follow-up Fuel Treatments	• Hand thinning, grapple piling and/or underburning may follow initial treatment if needed to meet objectives, except as restricted above in CSO and NOGO activity center areas. • Follow mitigations for VQO of Retention in Table 6.
Underburning	• Utilize low-intensity fire throughout the project area. • Favor natural features to control fire. Rehabilitate any necessary handline after project completion. • Burn during good smoke dispersion windows and/or during low use times of season.
Landings and Skid Trails	• In LBRA use only existing landings, do not create new landings. • Blend edges of landings into surrounding area, avoid straight lines or perfect circles, to maintain VQOs. • Maintain a VQO of retention along the Gold Lake Highway and within LBRA viewsheds. • Maintain a VQO of retention within Rx10 and partial retention within Rx14. **Error! Reference source not found.** in Appendix G is a map of VQOs in the project area. • Landings would range in size from 0.5 acre to 1 acre depending on topography and accessibility to treatment units. • Utilize cut material in a timely manner to minimize landing size.

Criterion	Design Features
	• Use existing temporary roads within Rx8. No new temporary road construction within Rx8. • Existing skid trails and temporary roads would be utilized where feasible. • Designated crossings would be utilized to cross existing Forest Service system recreation trails. • Skid trails, designated crossings, landings and temporary roads would be rehabilitated after treatment implementation is completed. • Do not clear wide corridors for skidding near viewpoints. Utilize turns in temp roads and skid trails when approaching viewpoints. • Minimize number of trail crossings used for skidding. Consult recreation specialist when locating crossings. Restore crossings with input from recreation specialist. See Table 6.
Snag Retention	• Within Sierra mixed conifer forest type, retain four of the largest snags per acre. Snags larger than 15 inches DBH and 20 feet in height would be used to meet this guideline.
Down Woody Material Retention	• Emphasize retention of wood in the largest size classes and in decay classes 1, 2, and 3.

Table 6. Design features to reduce deviation from visual quality objective (VQO) of retention.

Treatment	Evident Deviation	Design Feature
Mechanical Thin	Deviation from adjacent, untreated areas	Blend treatment edges into adjacent untreated areas through the use of texturing.
	Loss of screening in recreation sites, and along trails and roads	Retain varying age classes along the interface between view point and treatment.
	Visible high stumps	Low cut stumps (6 inches) within view of recreation sites, trails, and roads; retain screening.
	Timber marking persists after project completion	Mark "cut" trees, rather than "leave" trees. Black out any paint on marked trees not removed during implementation.
Mechanical Thin/Rec	Deviation from adjacent, untreated areas	Blend treatment edges into adjacent untreated areas. Involve recreation personnel in tree marking in recreation thinning.
	Loss of screening in recreation sites, and along trails and roads	Retain varying age classes along the interface between view point and treatment. Involve recreation personnel in tree marking in recreation thinning.
	Visible high stumps	Flush cut stumps within view of recreation sites, trails, and roads; retain screening.
	Timber marking persists after project completion	Mark "cut" trees, rather than "leave" trees. Black out any paint on marked trees not removed during implementation.
Temp Roads and Skid Trails	Temporary roads and skid trails highly visible; visual corridors remain after skid trails are obliterated	Construct no new temp roads within Rx8. Do not clear wide corridors for skidding near viewpoints such as roads, trails, and recreation sites. Utilize turns in temporary roads and skid trails when approaching such viewpoints.
	Trail damage caused by skid trail crossings	Minimize number of trail crossings used for skidding. Consult recreation specialist when locating crossings. Restore crossings with input from Recreation specialist.

Treatment	Evident Deviation	Recommended Mitigation
Hand Thin	Hand Piles persist after project completion	Build piles according to specifications and in accessible locations. Prioritize pile burning on the Lakes Basin project in District program of work.
	Deviation from adjacent, untreated areas	Blend treatment edges into adjacent untreated areas.
	Visible high stumps	Low cut stumps (6 inches) within view of recreation sites, trails, and roads; retain screening.
	Timber marking persists after project completion	Mark “cut” trees, rather than “leave” trees. Black out any paint on marked trees not removed during implementation.
Hand Thin/ Rec Sites	Deviation from adjacent, untreated areas	Blend treatment edges into adjacent untreated areas. Involve recreation personnel in tree marking in recreation thinning.
	Hand Piles are visible from recreation sites and sensitive viewpoints.	Consider chipping material rather than piling within view of recreation sites and sensitive viewpoints.
	Loss of screening in recreation sites	Retain varying age classes along the interface between view point and treatment. Involve recreation personnel in tree marking in recreation thinning.
	Visible high stumps	Flush cut stumps within view of recreation sites, trails and roads; retain screening.
	Timber marking persists after project completion	Mark “cut” trees, rather than “leave” trees. Black out any paint on marked trees not removed during implementation.
Meadow Improvement	Openings which do not match landscape pattern	Reopen meadows in areas where meadows and openings likely existed previously, such that openings are consistent with what would appear naturally. Avoid straight lines or perfectly round openings by adding texture to the treatment edges.
	Visible high stumps	Low cut stumps (6 inches) within view of meadows, recreation sites, trails and roads (including Gold Lake Highway); retain screening.
	Hand Piles are visible from recreation sites and sensitive viewpoints	Build piles according to specifications and in accessible locations. Prioritize pile burning on the Lakes Basin project in District program of work.

Treatment	Evident Deviation	Recommended Mitigation
Aspen Improvement	Deviation from adjacent, untreated areas	Ensure extended treatment zone edges match size, shape and pattern of existing clones in the landscape. Avoid straight lines or round shapes by adding texture to treatment edges.
	Visible high stumps	Low cut stumps (6 inches) within view of recreation sites, trails and roads; retain screening
	Hand Piles are visible from recreation sites and sensitive viewpoints.	Consider chipping material rather than piling within aspen stand. Build piles according to specifications and in accessible locations. Prioritize pile burning on the Lakes Basin project in District program of work.
	Timber marking persists after project completion	Mark "cut" trees, rather than "leave" trees. Black out any paint on marked trees not removed during implementation.
Grapple Piles	Machine Piles persist after project completion	Build piles according to specifications and in accessible locations. Prioritize pile burning on the Lakes Basin project in District program of work. Rehabilitate area after project completion.
Landings	Openings which do not match landscape pattern	Utilize existing openings as landings. Blend edges of landings into surrounding area through the use of texturing, avoid straight lines or perfect circles.
Underburning	Large patches of high mortality	Utilize low-intensity fire throughout the project area.
	Hand lines	Favor natural features to control fire. Rehabilitate any necessary handline after project completion.
	Smoke	Burn during good smoke dispersion windows and/or during low use times of season.
	Impacts to the Pacific Crest Trail (PCT)	Do not use the PCT as a hand line. If hand lines are needed, strive to keep lines out of view from the PCT. Rehabilitate after implementation.
	Impacts to PCT users	Communicate burning times with the Pacific Crest Trail Association so they can inform users. Burn during shoulder seasons (after snow melt and prior to July 1st, and after October 1st and prior to snowfall).

Grapple Piling, Hand Thinning, and Hand Piling in WUI Defense Zones and General Forest Units

Grapple piling, hand thinning, and hand piling would occur on 187 acres in WUI defense zones and 683 acres in general forest units. These treatments and associated activities would be tailored to achieve Visual Quality Objectives (VQOs) within areas designated by the Forest Plan as visual retention and partial visual retention management prescriptions (See Table 6, Table 7, and Figure 18).

Grapple Pile

Grapple piling is an effective treatment for reducing elevated surface fuel loading on ground up to 40% slope with short pitches of 100 feet slope distance up to 50%. Grapple piling equipment generally involves a tracked excavator that can physically move dead and downed fuels, live brush, and live trees up to 3.0 inches DBH. Grapple piling is proposed on approximately 139 acres of primarily brush fields to reduce surface fuel continuity and loading (brush, dead and down material). Grapple piles would subsequently be burned during an appropriate burn window. A mosaic of brush clumps, to benefit wildlife, would be retained while maintaining the integrity of fuels treatments.

Hand Thin with Grapple Pile

Hand thinning with grapple piling is proposed on approximately 116 acres. Trees less than 11.0 inches DBH would be thinned to improve species composition, structure, health, growth and reduce ladder fuels. Grapple piling would entail amassing activity created slash in addition to existing surface fuels (dead and downed trees and live brush). Grapple piles would later be burned during an appropriate burn window.

Hand Thin with Hand Pile

Hand thinning with hand piling is proposed on approximately 266 acres. Trees less than 11.0 inches DBH would be thinned to improve species composition, structure, health, growth, and reduce ladder fuels. Activity created fuels in addition to existing fuels would then be hand piled. Hand piles would be burned during an appropriate burn window.

Hand Thin with Hand Pile - Sierra Nevada Yellow Legged Frog (SNYLF)

Hand thinning and hand piling is proposed on approximately 301 acres of SNYLF occupied and suitable habitat. Conifer trees less than 11.0 inches DBH would be thinned to improve vegetation composition, release riparian vegetation and reduce ladder fuels. Activity created slash would be moved by hand and piled outside of the activity unit.

Hand Thin with Hand Pile - Recreation

Hand thinning with hand piling of trees less than 11.0 inches DBH is proposed on approximately 48 acres within recreational areas (e.g established campgrounds, lodges, and trailheads to remove hazard trees and address excessive fuels). Also, pullouts along Gold Lake Highway, where mechanical removal of trees is not a viable option, trees up to 11.0 inches DBH would be felled and piled by hand. Piles would be burned during an appropriate burn window. Lastly, tree

planting, where deemed necessary, is proposed within established and dispersed recreation sites to replace removed hazard trees and maintain campsites with tree cover. Trees proposed for planting include Jeffrey pine, sugar pine, and western white pine or other site appropriate species.

Underburn

Underburning is proposed on approximately 2,404 acres outside of areas where mechanical or hand treatments are proposed. Approximately 54 acres of the 2,404 occur within the WUI defense zone. This would perform benefits to the ecosystem including re-introducing fire into a fire adapted ecosystem and reducing hazardous fuel loading from 100 years of fire exclusion. Additionally the underburn would provide protection from future high-intensity fire to the numerous values at risk in the Lakes Basin such as historic lodges, power and telephone infrastructure, the community of Graeagle, and the general public who recreate in this area during peak fire season. The underburn only area consists of numerous trails and natural boundaries that will allow fire managers to break up burn units into manageable sections with little to no ground disturbance by fire lines. This will also aid fire managers in producing a low- to moderate-intensity burn across an area that is not treatable by mechanized equipment or any method other than fire.

Table 7. Design features for fuel treatments including hand thin, grapple pile, and underburning

Criterion	Design features
Grapple Piling	• Pile dead and downed material and live brush. • Maintain mosaic of brush clumps. • Grapple pile live trees up to 3.0” DBH. • Slopes up to 40% would be treated with short pitches of 100 feet slope distance up to 50%. • Build piles according to specifications and in accessible locations. Prioritize pile burning on the Lakes Basin Project in District program of work. See Table 6 for VQO mitigations.
Hand Thinning with Grapple Piling	• Cut conifer trees <11.0”DBH and pile with mechanical equipment. • Pile activity created slash, existing slash, and live brush. Maintain large woody debris component and brush mosaic for wildlife habitat. • Slopes up to 40% would be treated with short pitches of 100 feet slope distance up to 50%.
Hand Thinning with Hand Piling	• Cut conifer trees <11.0” DBH. • Hand pile activity created slash and existing slash. • Build piles according to specifications and in accessible locations. Prioritize pile burning on the Lakes Basin Project in District program of work. • Blend treatment edges into adjacent untreated areas to maintain VQOs. See Table 6.
Hand Thin Aspen Stands	• Cut all conifers <11.0” DBH within aspen stand and within the extended treatment zone, up to 1 ½ tree heights from the edge of existing aspen stand. • Pile activity created slash and existing slash. • Ensure openings match size, shape and pattern of existing openings in the landscape. Avoid straight lines or round openings by adding texture to the treatment edges to maintain VQOs.

Criterion	Design features
Hand Thin Meadows	• Cut all conifers <11.0" DBH within meadows utilizing historic meadow boundaries. • Hand carry activity created slash to adjacent treatment units and pile. • Reopen meadows in areas where meadows and openings likely existed previously, such that openings are consistent with what would appear naturally. Avoid straight lines or perfectly round openings by adding texture to the treatment edges.
Hand Thin SNYLF	• Cut conifers <11.0". • Hand carry activity created slash to adjacent treatment units and pile.
Hand Thin Recreation Sites	• Removal of hazard trees. Hazard Trees >30.0" DBH may be removed. • Cut selected trees <11.0" DBH considered ladder fuels. • Plant site appropriate tree species to replace hazard trees. • Blend treatment edges into adjacent untreated areas. Involve recreation personnel in tree marking in recreation thinning. Consider chipping material rather than piling within view of recreation sites and sensitive viewpoints. • Retain varying age classes along the interface between view point and treatment. Involve recreation personnel in tree marking in recreation thinning. • Flush cut stumps within view of recreation sites and trails, retain screening. See Table 6 for VQO requirements. • Mark "cut" trees, rather than "leave" trees. Black out any paint on marked trees not removed during implementation.
Follow-up Fuel Treatments	• Grapple and hand piles would be burned during appropriate burn windows. • Except where prohibited, fire would be allowed to creep between piles to provide for a concurrent understory burn. • All units would be evaluated for underburning post-treatment, except as restricted above in CSO and NOGO activity center areas.
Underburning	• Utilize low-intensity fire throughout the project area. • Favor natural features to control fire. Rehabilitate any necessary handline after project completion. • Burn during good smoke dispersion windows and/or during low use times of season.
Down Woody Material Retention	• Emphasize retention of wood in the largest size classes and in decay classes 1, 2 and 3.

Treatments to Improve aspen stands and meadow systems

Conifer Removal

Mechanical treatments within aspen stands are proposed on approximately 39 acres and would utilize ground based logging systems involving individual tree selection (ITS) and whole-tree yarding following criteria stated in Table 5. Conifers would be removed within the stand and within a variable width extended treatment zone (ETZ) measured from the outermost aspen stem. The ETZ distance from existing aspen would vary based on adjacent conifer tree height, topography, site suitability or identified limitations. ETZ width would not be greater than one and a half times the height of the tallest adjacent conifer tree. Additional aspen clones or stands that are identified during field operations within treatment units may be treated similarly upon

specialist review and approval. Hand thinning and hand piling treatments would be utilized where needed to remove residual conifers following mechanical treatments.

Mechanical thinning in aspen is not designed to meet objectives associated with fuels or stand densities, therefore the removal of trees greater than 30.0 inches DBH is permitted (USDA 2004, page 51). Some trees greater than 30.0 inches DBH would be removed. Select tree species (including but not limited to pine species, Douglas-fir, and red fir) and those exhibiting old tree characteristics (downward or outward sweeping branches and/or rounding or flat crown apex) or desirable wildlife characteristics would be preferred for retention.

Hand thin with Hand Pile - Aspen

Hand thinning with hand piling is proposed on approximately 32 acres of aspen stands. All conifer trees less than 11.0 inches DBH would be removed within the stand and within a variable width extended treatment zone (ETZ) measured from the outermost aspen stem. The ETZ distance from existing aspen would vary based on adjacent conifer tree height, topography, site suitability or identified limitations. ETZ width would not be greater than one and a half times the height of the tallest adjacent conifer tree. Activity created fuels in addition to existing fuels would then be hand piled. Hand piles would be burned during an appropriate burn window.

Hand thin with Hand Pile - Aspen

Approximately 43 acres of hand thinning and hand piling would encompass dry and wet meadow units. A majority of encroaching conifers less than 11.0 inches DBH would be cut within the interior of meadows. Also, meadows that are not adjacent to mechanical thin units, would include what is determined to be the historic meadow edge. Historic boundaries may be identified by the presence of sparse meadow plants, slope breaks, historic photos, or historic aerial photos.

Activity created slash would be removed by hand and piled outside of the meadow units. Also, additional meadows that are identified during field operations within treatment units may be treated similarly upon specialist review and approval.

Treatments to improve watershed conditions

The road-related work proposed with this project is in accord with the Plumas National Forest Public Motorized Travel Management Plan (USDA 10a,b). In summary, a total of approximately 3.6 miles of non-system roads would be decommissioned, closed and/or obliterated; 9.3 miles of system roads would have reconstruction and maintenance to facilitate fuels and silviculture activities and improve drainage features; and up to 5 miles of temporary road would have construction, then be subsequently restored. In addition, 1.2 miles of non-system roads would be brought into the system in order to maintain access to system trails and dispersed camping sites. Table 8 displays the design elements for road access under the Proposed Action.

Table 8. Design features for road treatments

Criterion	Design features
Decommission/Obliteration	• Decommissioning/Obliteration may involve recontouring, subsoiling or abandonment. Abandonment is appropriate where the road has become completely overgrown with vegetation. • Decommissioning/Obliteration may also involve removing drainage structures, restoring vegetative cover, blocking access or some combination of these treatments.
Maintenance	• Maintenance would consist of installation of road dips to better disperse runoff from road surfaces; brushing, blading the road surface, improving drainage.
Reconstruction	• Reconstruction may involve the widening of curves, additional cut and fill to accommodate chip vans. • Installation of road dips to better disperse runoff from road surfaces. Placement of 2-3 inch diameter rock armor may be necessary at the outlet of the dip. • Construction of armored overflow dips at certain culverts to ensure that if the culvert is plugged, diverting the stream along the road would be minimal. • Additional improvements may include out-sloping road segments, constructing low water crossings and/or replacing culverts.
New Temporary Roads	• Temporary roads would be constructed for project work and subsequently restored when the fuels and vegetation management work is complete. • All temporary roads would be closed with a constructed barrier after use. Road surfaces would be subsoiled to depth of 18 inches to restore hydrologic function and the road area would be re-contoured to match slopes of the surrounding natural landscape if in a Riparian Conservation Area. • Utilize turns in temp roads when approaching viewpoints.

Alternative 2 – California Spotted Owl Habitat Alternative

Treatments to improve forest health and resiliency and reduce fuel loads.

The California Spotted Owl Habitat Alternative has been designed to comply with the Draft Interim Recommendations for the Management of California Spotted Owl Habitat on National Forest System Lands (USDA 2015, hereafter these will be referred to as the IRs). The treatments in Alternative 2 would be the same as Alternative 1 with the exceptions described below. Refer to Appendix B Figure 15 for a map of proposed treatments under Alternative 2. Proposed treatments in this alternative are designed to reduce the risk to California spotted owl habitat in the short term relative to the risk associated with current standards and guidelines. The recommendations incorporated into this alternative are intended to provide a balance of conserving existing high-quality habitat, enhancing habitat conditions through management, and reducing the risks of habitat loss through high-intensity fire (USDA 2015, page 2). The goals set forth in the IRs are consistent with the overall goals for the Lakes Basin Project. The recommended management activities outlined in the IRs are more restrictive than Alternative 1. To comply with the IRs, Alternative 2 would include the following:

- Designated spotted owl habitat includes 1,000 acres for the territory within the Protected Activity Center (PAC) and Home Range Core Area (HRCA). Within designated habitat acres for the California spotted owl, no mechanical treatment would occur on all but 35 acres. These 35 acres are at the edge of the HRCA, are a fairly even aged stand and the habitat would benefit from thinning. Prohibited mechanical treatments include mechanical thinning, mastication, and grapple piling. Hand treatments within designated habitat would be limited to the removal of small-diameter woody material up to 11 inches DBH through hand-thinning, pile burning, and/or prescribed burning (USDA 2015, page 17, #6a).
- 333 acres in the HRCA that would be mechanically thinned under Alternative 1 would be hand thinned and piled and 18 acres of hand thinning would be changed over to no treatment under Alternative 2.
- On approximately 143 acres there would be no treatment.
- 35 acres of mechanical treatment utilizing variable density thinning, no trees greater than 24.0 inches DBH would be removed.

For Alternative 2, all design criteria listed under Alternative 1 would apply plus additional design criteria described in Table 9.

Table 9. Additional design features applicable to Alternative 2 only

Criterion	Design features
VDT Matrix Thinning (areas between clumps and openings)	Removal of trees <24.0" DBH would occur in areas where mechanical units share a common boundary with meadows (meadow buffers) to reduce conifer encroachment and seed sources associated with shade-tolerant tree species.
Mechanical Thin CSO HRCA	Variable density thinning removing trees up to 24.0" DBH. Post treatment underburn, except in units between Gold Lake Highway and Frazier Falls Road.

Treatments to improve aspen stands and meadow systems

Treatments to improve aspen and meadow systems in Alternative 2 are identical to Alternative 1.

Treatments to improve watershed conditions

There likely will be fewer miles of temporary road construction under Alternative 2 as compared to Alternative 1. This is because some units proposed for mechanical thinning under Alternative 1 are proposed for hand thinning or no treatment under Alternative 2; therefore, fewer temporary roads would be needed to implement Alternative 2.

Alternative 3 – No-Action Alternative

This alternative serves as a baseline for comparison among the alternatives. Current, on-going activities such as routine road maintenance, fire suppression and recreation would still occur in this area. However, the treatments designed in this project to reduce hazardous fuels, improve forest health, re-introduce fire, maintain and promote aspen on the landscape, reduce conifer encroachment within meadows, and reduce the impacts of roads would not occur. Since forest

ecosystems are not static, they would still continue to change as a result of naturally occurring dynamic forces such as forest succession and wildfires. The current existing condition of high fuel loading, diseased and overstocked stands, and road impacts would not be addressed under the No-Action Alternative.

Comparison of Alternatives

This section provides a summary of the effects of implementing each alternative. Information in Table 10 is focused on activities and on effects where different levels of effects or outputs can be distinguished quantitatively, or qualitatively, between the alternatives.

Table 10. Comparison of the effects of each alternative based on measurement indicators

Resource	Measurement Indicator	Alternative 1 Proposed Action	Alternative 2 Spotted Owl Habitat	Alternative 3 No-Action
Wildfire Hazard	Predicted Mortality (% basal area)	7-31	77	75-89
	Crowning Index (mph)	25-51	18	17-20
	Probability of Torching (%)	1-6	<1	28-34
	Canopy Base Height (ft)	24-31	39	5-8
	Canopy Density (kg/m3)	0.03-0.096	0.143	0.137-0.154
Forest Health (Stand Density)	Trees Per Acre	77-98	186	616-676
	Basal Area (ft2/ac)	120-182	262	263-274
	Relative Stand Densities, <60%	28-46	67	74
Project Level Heterogeneity	Canopy Cover (%)	31-42	62	58-61
	QMD (inches)	20.1-21.7	17.7	14.9
Species Composition	Species Composition (% of shade-intolerant trees by trees per acre)	16-53	20	9
Wildlife	Change suitable habitat for old forest species (4M, 4D, 5M, 5D, 6) to unsuitable	330 Acres of 4M and 4D habitat to 4P habitat (These acres are in WUI: 298 acres and aspen stands: 32 acres)	137 Acres of 4M and 4D habitat to 4P habitat (These acres are in WUI: 105 acres and aspen stands: 32 acres)	0 Acres
	Aspen Restoration Treatments	71 Acres	71 Acres	0 Acres

Resource	Measurement Indicator	Alternative 1 Proposed Action	Alternative 2 Spotted Owl Habitat	Alternative 3 No-Action
	Designated Critical Habitat Affected	3,424 Acres	3,424 Acres	0 Acres
	Changes in road densities (miles/ sq. mile)	Decrease 0.3 miles/sq. mile	Decrease 0.3 miles/sq. mile	0 miles
Botany	**Acres of rare plant sites Affected**	7.1	7.1	0
	Number of rare plant sites Affected	5	5	0
	Acres of Noxious Weed Sites Affected	0.6	0.6	0
	Number of Noxious Weed Sites Affected	3	3	0
Soils and Hydrology	**NFS Road Improvement**	9.3 miles	9.3 miles	0 miles
	Non-system Road Obliteration	3.6 Miles	3.6 Miles	0 Miles
Economics	**Sawlog Volume**	8,260 mbf	6,189 mbf	0 mbf
	Receipt Act[1]	$33,173	$24,860	$0
	Yield Tax[2]	$26,968	$20,208	$0
	Total Harvest Value	$929,942	$696,824	$0
	Treatment (Harvest) Cost	$1,755,196	$1,339,979	$0
	Total Full Time Jobs	211	178	0
	Total Employee Related Income	$9,066,281	$7,639,212	$0
Recreation Visual Quality	**Project Meets VQO Standards**	Consistent, potential for improvement	Consistent, potential for improvement	Consistent, potential for degradation
Recreation Opportunity Spectrum	**Project Meets ROS Remoteness standards**	Consistent with mitigations	Consistent with mitigations	No effect
Transportation[3]	**Level 3 Roads, Passenger Vehicle**	Add 0.8 Miles to NFS System	Add 0.8 Miles to NFS System	No change
	Level 2 Roads, High Clearance Vehicle	Add 0.3 Miles to NFS System	Add 0.3 Miles to NFS System	No change
	Non-System Roads	Decrease 3.6 Miles	Decrease 3.6 Miles	No change

[1]**Receipt Tax**: 25% of total National Forest revenues from timber and biomass sales paid to the state with calculated returns to county for schools and roads; [2]**Yield Tax**: 2.9 % of private timber operator revenues from timber harvest paid to the state, 80% of which is returned to the county in which the timber was harvested; [3]**Transportation**: Follows Forest Plan (USDA 1988a), Sierra Nevada Forest Plan Amendment (USDA 2004a,b), and the Plumas National Forest Public Motorized Travel Management Plan (USDA 10a,b) direction.

Alternatives Eliminated from Detailed Study

Federal agencies are required to rigorously explore and objectively evaluate all reasonable alternative actions and to briefly discuss the reasons for eliminating any alternatives that were not developed in detail (40 CFR 1502.14). Public comments we received in response to the proposed action provide suggestions for alternative methods for achieving the purpose and need. Some of these alternatives are outside the scope of the need for the proposal, duplicative of the alternatives we considered in detail, or are components that would cause unnecessary environmental harm. Therefore, we have considered a number of alternatives, but eliminated them from detailed study for the reasons summarized below.

Alternative 4 - Hand Thin and Underburn Only Alternative

One comment was that "mechanical thinning…should be dropped because it will by its very nature harm the environment and will not achieve overall, short-, mid-, and long-term resource restoration (aspen and meadow) or fire resiliency as well as hand thinning or underburning alone would." The same commenter suggested that thinning materials up to 6-inch diameter alone would achieve the removal of the dense understory and ladder fuels resulting in conditions that allow for prescribed fire to be introduced or that result in sending fire to the ground in the event of wildfire.

Hand thinning was modeled under Alternative 2 (Spotted Owl Habitat Alternative). Treatment units which were mechanical thin under Alternative 1 and shifted to hand thin under Alternative 2 (333 acres) were modeled and used as proxies for the remaining mechanical thin units. Modeling variables included thinning trees up to 11.0 inches DBH to a 30 foot by 30 foot spacing. Table 11 displays attributes of stands where prescribed treatments shifted from mechanical thinning to hand thinning. Compare the attributes of stands in Table 11 to those attributes of Table 12 in which prescribed treatments remain as mechanical thinning.

Table 11. Measurement indicators of acres where treatments shifted from mechanical thin to hand thin under Alternative 2.

	Trees Per Acre	BA/A (ft^2/ac)	Relative SDI (%)	Quadratic Mean Diameter (Inches)	Crowning Index (mph)	Probability of Torching (%)	Canopy Base Height (Feet)	Canopy Density (kg/m^3)	Basal Area Mortality (%)
Existing	777	313	89	14.5	17	25	6	.152	99
Year 0	186	262	67	17.7	17.7	<1	39	.143	77
Year 10	213	295	73	19.1	17.7	0	45	.141	77
Year 20	187	317	77	20.7	19.1	<1	50	.128	77

Table 12. Measurement indicators of acres where treatments remained mechanical thin under Alternative 1

	Trees Per Acre	BA/A (ft^2/ac)	Relative SDI (%)	QMD (Inches)	Crowning Index (mph)	Probability of Torching (%)	Canopy Base Height (Feet)	Canopy Density (kg/m^3)	Basal Area Mortality (%)
Existing	777	313	89	14.5	17	25	6	.152	99
Year 0	85	179	43	21.6	28	<1	44	.074	7
Year 10	94	201	47	23.7	29	<1	52	.069	6
Year 20	93	230	52	25.5	29	<1	57	.068	5

Because hand thinning only removes trees less than 11.0 inches DBH, overall trees per acre (TPA), basal area per acre (BA/A) and relative stand density index (SDI %) would be reduced by hand thinning, but not as much as seen in the mechanical thinning model. Canopy base height and crowning index increase more with mechanical thinning than hand thinning, which is desirable. Probability of torching does not differ significantly between both models. Hand thinning does not adequately address canopy density. Based on all these values, potential mortality associated with wildfire (under severe conditions) would remain high with the hand thinning only alternative (77 percent) in comparison to the mechanical thinning alternative (5 to 7 percent).

In summary, areas that change from mechanical thinning to hand thinning would be left at higher risk to density-related mortality caused by insects and disease and higher levels of mortality associated with potential wildfire. Species composition would be slightly affected but conditions conducive to promoting shade-intolerant conifers (i.e. canopy openings) would not be created. Stands would maintain a homogeneous condition over time and would not meet the purpose and need of the project (USDA 2018a).

These results are for a 333-acre area in which trees with an upper DBH limit (11.0 inches) are removed. If extrapolated to the remaining mechanical units within the project area (approximately 1,781 acres additional) and where trees with a lower upper DBH limit (6.0 inches) were hand thinned (thus smaller tree size and smaller total number of trees thinned) as suggested by the commenter, then the results would be at least equal to, but likely less than, those shown in Table 11. This would render treatments even less effective over the entire project area, and result in not meeting the desired conditions for the forest health and resiliency purpose and need for the project. Because it would not meet the purpose and need for the project, this alternative was eliminated from detailed study.

Environmental Impacts of the Proposed Action and Alternatives

This section summarizes the potential impacts of the proposed action and alternatives for each impacted resource. Each resource section provides a summary of project specific reports, assessments, and/or input prepared by Forest Service specialists, which are incorporated by reference into this EA. The following reports or memoranda are incorporated by reference: Lakes Basin Project Forest Vegetation Report by Paul Czeszynski (USDA 2018a), Lakes Basin Project Fire and Fuels report by Don Fregulia (USDA 2018b), Lakes Basin Project Biological Evaluation Terrestrial and Aquatic Wildlife (USDA 2018c) and Lakes Basin Project Biological Assessment for the Sierra Nevada Yellow-legged Frog and Designated Critical Habitat (USDA 2017a) by Debbie Bliss, Lakes Basin Project Water and Soil Resource Effects Assessment by Antonio Dueñas (USDA 2018d), Lakes Basin Project Biological Evaluation for Threatened, Endangered or Sensitive Plant Species by Mike Friend (USDA 2018e), Lakes Basin Project Recreation Opportunity and Visual Quality Report by Sam Commarto (USDA 2018f), Transportation Analysis Report for the Lakes Basin Project by Christopher Frappier (USDA 2018g), and Cultural Resources Compliance for the Environmental Analysis of the Lakes Basin Project by Mary Kliejunas (USDA 2018h). These reports are part of the project record on file at the Beckwourth Ranger District. Additionally, there are the Lakes Basin Project Management Indicator Species Report (USDA 2017b) and Lakes Basin Migratory Bird Species Report (USDA 2017c) by Debbie Bliss, Lakes Basin Project Economics Report by Kasandra Meyer (USDA 2018i) and Lakes Basin Project Air Quality Report by Martin Senter (USDA 2018j) that are referenced in this EA, but not summarized. These reports also can be found in the project record.

Direct and Indirect Effects

Direct effects are caused by the action and occur at the same place and time as the action. Indirect effects are caused by the action but occur later in time or further removed in distance, but are still reasonably foreseeable.

The environmental consequences address the impacts of actions proposed under each alternative. This effects analysis was done at the project level. Resource specialists reviewed each affected unit or road proposed in the alternatives.

As described in the Proposed Action and Alternatives section, for ease of documentation and understanding, the effects of the alternatives are described separately for distinct actions. The combination of these distinct actions is then added to the on-going and reasonably foreseeable actions in the cumulative effects analysis. The distinct actions analyzed for each alternative are mechanical thinning, grapple piling, hand thinning and piling, pile burning, and underburning to strategically reduce fuel loads, increase forest health and fire resiliency, improve aspen stands and meadow systems. Other actions analyzed for each alternative are road maintenance and reconstruction, temporary road construction, and temporary road and non-system road obliteration to provide access and improve watershed conditions by reducing transportation system effects.

Cumulative Effects

According to the Council on Environmental Quality (CEQ) NEPA regulations, “cumulative impact” is the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such actions (40 CFR § 1508.7).

The cumulative effects analysis area varies according to the resource being analyzed. Past activities are considered part of the existing condition and are discussed in the “Affected Environment” and “Environmental Consequences” sections under each resource. Appendix D provides a list of present, on-going and reasonably foreseeable future actions that could potentially contribute to cumulative effects.

In order to understand the contribution of past actions to the cumulative effects of the Proposed Action and alternatives, this analysis relies on current environmental conditions as a proxy for the impacts of past actions. This is because existing conditions reflect the aggregate impact of all prior human actions and natural events that have affected the environment and might contribute to cumulative effects.

The cumulative effects analysis, for each specialist’s cumulative effects section, with the exception of the Water and Soil Resource Effects Assessment, does not attempt to quantify the effects of past human actions by adding up all prior actions on an action-by-action basis. There are several reasons for not taking this approach. First, a catalog and analysis of all past actions would be impractical to compile and unduly costly to obtain. Current conditions have been impacted by innumerable actions over the last century (and beyond), and trying to isolate the individual actions that continue to have residual impacts would be nearly impossible. Second, providing the details of past actions on an individual basis would not be useful to predict the cumulative effects of the Proposed Action or alternatives. In fact, focusing on individual actions would be less accurate than looking at existing conditions, because there is limited information on the environmental impacts of individual past actions, and one cannot reasonably identify each and every action over the last century that has contributed to current conditions. Furthermore, focusing on the impacts of past human actions risks ignores the important residual effects of past natural events. These important past events may contribute to cumulative effects just as much as human actions. By looking at current conditions, we are sure to capture all the residual effects of past human actions and natural events, regardless of which particular action or event contributed those effects. Third, public scoping for this project did not identify any public interest or need for detailed information on individual past actions. Finally, the Council on Environmental Quality issued an interpretive memorandum on June 24, 2005 regarding analysis of past actions, which states, “agencies can conduct an adequate cumulative effects analysis by focusing on the current aggregate effects of past actions without delving into the historical details of individual past actions”.

Most of the specialists use the aforementioned cumulative effects analysis rationale, with the exception of the Water and Soil Resource Effects Assessment, where past actions over a 30-year

period are used as an input to the Equivalent Roaded Acre analysis model. A list of past treatment types, year and acres are provided in a separate table.

Vegetation

Historic Reference Conditions

Before Euro-American settlement, relatively frequent fires strongly influenced the composition, structure, and dynamics of most forest ecosystems in the Sierra Nevada. These fires, mostly low to moderate in severity, caused changes by damaging or killing plants and setting the stage for regeneration and vegetation succession. They maintained surface fuels to fairly low levels, and in most areas kept forest understories relatively free of trees and other vegetation (Weatherspoon 1996). Across the state of California, the mean fire return interval (FRI) for yellow pine (those characterized the occurrence of one or both yellow pine species, ponderosa pine and Jeffrey pine) and mixed conifer (YPMC) forests ranged from 11 to 16 years. Mean minimum FRIs were around 5 years for both forest types, and mean maximum FRIs ranged from 40 to 80 years (Safford and Stevens 2017).

Besides naturally occurring fires, fire was used by the Maidu and other local Native American tribes as a means to enhance young shoot growth for basket weaving, to clear shrubs for hunting, and to reduce natural fire hazard. The Maidu established permanent villages and seasonal camps in the American Valley (Quincy), Indian Valley (Taylorsville), Genesee Valley, Sierra Valley (Portola) and the Susanville area, among others (Moody et al 2006) and utilized the Lakes Basin area seasonally.

In the Sierra Nevada, much has been made of the drastic ecosystem changes wrought by Euro-Americans since their arrival in California in the mid-19th century. Numerous scientific studies have documented these changes which result from-among other things-changed fire regimes, logging, livestock grazing, mining, agriculture, hunting, growing human populations and their infrastructure, air and water pollution, species introduction, water diversion, and most recently, climate warming. In lower and middle-elevation forests of the Sierra Nevada, the combined impacts of these human influences have resulted in major changes in forest composition and structure (North 2012). In Plumas County, Euro-American settlement coincided with the California Gold Rush. By 1860, bustling communities existed in the American, Indian, and Sierra Valleys, and in the Big Meadows area. A logging industry quickly developed to support mining and the fast growing towns.

One of the most profound effects of Euro-American settlement in California was the near extinction of fire as an ecological process, beginning with the decimation of the Native American population in the nineteenth century, and followed by a policy of fire exclusion in the early twentieth century. Fire was the dominant ecological process controlling forest structure and succession in western North American conifer forests for thousands of years (Miller and Safford 2017). Yellow pine (YP) forests and mixed conifer (MC) forests were not characterized by large, stand-replacing disturbance events (Safford and Stevens 2017), they historically supported fire regimes characterized by frequent low- to moderate-severity fires that maintained a

heterogeneous uneven-aged forest structure with large fire-resistant trees by opening small canopy gaps and thinning out most regenerating trees (Miller and Safford 2017).

In the late 1920s and 1930s Albert Everett Wieslander and several others explored much of California's wildland, sampling vegetation, taking photographs, and drawing detailed maps of what they found, now known as the Wieslander Vegetation Type Mapping (VTM) collection (http://www.lib.berkeley.edu/BIOS/vtm/mapping.html). The purpose of the survey was "to collect information basic in character for many purposes, so that it will be of value, not only for obvious needs of the present, but also for perhaps unforeseen developments of the future" (Wieslander 1935).

Thousands of 1/5 acre vegetation plots were sampled in YPMC forest types. The VTM protocol only sampled trees 4 inches DBH and above, so the relative densities of species sampled are biased away from the youngest cohorts of trees, which were dominated by white fir and incense cedar that were beginning to benefit from two to three decades of fire suppression. Because of this, relative tree densities represented in the VTM data set provide, at least, an approximate idea of dominance patterns among tree species before fire suppression.

Recently digitized VTM maps depict the Lakes Basin Project area as having historically been dominated by Jeffrey pine (*Pinus jeffreyi*) forests in addition to expanses of montane chaparral and red fir (*Abies magnifica*) forests at higher elevations. Jeffrey pine forests generally had ponderosa pine, white fir and Douglas-fir as secondary and tertiary species.

Forest structure is much different in contemporary forests compared to pre-settlement times. Table 13 displays estimates from several studies of forest structure for pine dominated and mixed conifer forests in California and northern Mexico adapted to an active fire disturbance regime. Based on these studies, historical average trees per acre would have ranged from 27 to 65 TPA and relative densities from 18 to 53 percent. Also, Figure 2 displays several studies listed in Table 11, comparing current versus historical diameter distribution. The figure portrays size class distributions and shows that modern forests tend to follow a "reverse J-shaped " distribution, where most trees are small, with fewer medium and few large trees, while historical forests tended to follow a flat or hump-shaped size class distribution, where most trees were medium size. Recurrent fire in historic forests killed most juvenile trees and successful recruitment was somewhat of a stochastic event, when seed production happened to coincide with a period of sufficient precipitation and little or no fire (Safford and Stevens 2017).

Although historic reference conditions are not to be used to recreate strict or absolute structural targets in the face of future uncertainty, these conditions are used as insight into the processes that have and will continue to shape forest structure and composition. These reference conditions represent a landscape which was shaped by ecological processes and is thought to be more resilient to natural disturbance regimes (North et al. 2009; North 2012).

Table 13. Estimates of forest structure for pine dominated and mixed conifer forests in California and northern Mexico adapted to an active fire regime.

Study	Study Site	Forest Type	Time Period	TPA1	BA (ft2/acre)1	Diameter (inches)1	Relative Density2
Taylor 2004, 2006 and 2007	Northern Sierra: Lake Tahoe	JP-mixed conifer	Pre-fire suppression (ca. 1870-1900)	28 (12-46)	111 (55-156)	26.5 (21.5-33.6)	29%
Taylor (unpublished data) in Taylor 2008	Central Sierra: Yosemite Valley	Ponderosa pine-black oak	Pre-fire suppression (unknown)	36 (31-38)	95 (39-117)	21.9A	28%
North et. al 2007	Southern Sierra: Teakettle Forest	JP-mixed conifer	Pre-fire suppression (ca. 1865)	27B	225B	19.5B	18%
Taylor and Scholl 2006 in Taylor 2008	Central Sierra: Yosemite NP	JP-mixed conifer	Pre-fire suppression (ca. 1899)	54 (4-210)	186 (21-452)	25.2A	53%
Scholl and Taylor 2010	Central Sierra: Yosemite NP	JP-mixed conifer	Pre-fire suppression (ca. 1899)	65 (16-263)	130 (1-387)	20.7 (3.2-43.6)	46%
Stephens and Gill 2005	Northern Mexico: Sierra San Pedro Martir	JP-mixed conifer	Contemporary forest with unaltered disturbance regime	59 (12-130)	87 (25-221)	12.8 (1.0-44.1)	20%
Taylor 2001, Taylor 2010	Southern Cascades: Ishi Wilderness	Ponderosa pine-black oak	Contemporary forest with unaltered disturbance regime	47 (29-64)	108 (65-142)	20.6 (17.6-23.6)	33%

[1]Ranges are provided in parentheses

[2]Calculation of relative density is based upon maximum SDI from Long and Shaw's draft density management diagram for pine-dominated Sierran Mixed Conifer forests. Using a maximum SDI of 450 provides a very liberal estimate of density because relative density (current SDI/maximum SDI) would have even lower values if a higher maximum SDI was used.

[A] Mean diameter was calculated using TPA and BA per acre

[B] No range provided

[C] Skinner and Taylor (2006) discuss the applicability of the Beavery Creek Pinery site in the Ishi Wilderness in sidebar 10.2 (pages 207-209).

Figure 2. Comparisons of reconstructed historical tree size class distribution from three sites. Top from North et al. 2007; Middle from Taylor 2004; Bottom from Scholl and Taylor 2011 (From Safford and Stevens 2017).

Existing conditions

California Wildlife Habitat Relationships Types and Distribution

California Wildlife Habitat Relationships (CWHR) types were used to describe the vegetative landscape and heterogeneity within the project area. CWHR types are comprised of three attributes: vegetation type, vegetation size, and density class.

The dominant CWHR vegetation types within the Lakes Basin Project area is Sierran mixed conifer (SMC) and montane chaparral (MCP) (Table 14). Other forest vegetation types include: red fir (RFR), lodgepole pine (*Pinus contora var. murrayana*, LPN), ponderosa pine/Jeffrey pine (PPN/JPN) and sub-alpine (SCN). Non-forest types include montane riparian/wet meadow (MRI/WTM), annual grasslands (AGS), barren areas (BAR), lakes and ponds.

Table 14. CWHR vegetation types within the Lakes Basin Project area

CWHR Type	Acres	Percent of Project Area
Sierran Mixed Conifer (SMC)	6,740	53%
Montane Chaparrel (MCP)	3,483	27%
Red Fir (RFR)	681	5%
Lodgepole Pine (LPN)	367	3%
Montane Riparian/Wet Meadow (MRI/WTM)	216	2%
Ponderosa Pine/Jeffery Pine (PPN/JPN)	136	1%
Sub-Alpine (SCN)	59	<1%
Annual Grassland (AGS)	46	<1%
Barren (BAR)	6	<1%
Water (Lakes/Ponds)	842	7%
Urban (URB)	98	<1%
Totals	**12,674**	**100%**

The predominant CWHR size class for forested acres within the Lakes Basin Project area is size class 4 (Table 15), small trees ranging in size from 11.0 inches to 24.0 inches DBH. The quadratic mean diameter (QMD) for size class 4 stands ranges from 11.8 inches to 17.0 inches DBH, averaging approximately 15.8 inches DBH. Size class 4 comprises approximately 95 percent of forested acres, indicating a homogenous landscape lacking in other seral stages. The desired condition is one that is more diverse in size class distribution. As Table 15 indicates, there is a lack of seral condition diversity (lacking size classes 1, 2, 3, 5 and 6) within the project area. The current homogenous stand structure is unstable due to its vulnerability to high-severity fires, large insect and disease occurrences, and landscape-level mortality from drought.

The dominant canopy condition (CWHR density class codes S and P represent an open canopy and codes M and D represent a closed canopy) for forested acres within the project area is closed, with 35 percent of acres within the moderate (M) density class and 37 percent of acres in the dense (D) density class. Table 16 displays the percent distribution of CWHR size classes and associated density classes of forested vegetation within the project area.

Table 15. CWHR size class distribution within the Lakes Basin Project area.

Vegetation Type	CWHR Size Class						Total Acres	Percent of Total
	1 (<1 inch)	2 (1–6 inches)	3 (6-11 inches)	4 (11-24 inches)	5/6 (>24 inches)	N/A		
Mixed Conifer	0	6	247	6,461	25	0	6,739	53%
Other Conifer Forest[1]	0	<1	113	1,130	<1	0	1,243	10%
Non-Forest[2]	0	0	0	0	0	4,692	4,692	37%
Grand Total	0	6	360	7,591	25	4,692	**12,674**	

1-Other conifer forests include: red fir, lodgepole pine, ponderosa pine, Jeffrey pine, Sierran mixed conifer.
2-Non-forest includes: montane chaparral, montane riparian/wet meadow, annual grasslands, barren, water, urban.

Table 16. CWHR density class distribution within the Lakes Basin Project area.

Vegetation Type	CWHR Density Class*					Total Acres	Percent of Total
	D	M	P	S	N/A		
Mixed Conifer	2,719	2,357	1,409	254	0	6,739	53%
Other Conifer Forest[1]	230	413	477	123	0	1,243	10%
Non-Forest[2]	0	0	0	0	4,692	4,692	37%
Grand Total	2,949	2,770	1,886	377	4,692	**12,674**	

*% Canopy Closure: D=60-100%; M= 40-59%; P=25-39%; S=10-24%; N/A = Not Determined

Canopy cover averages approximately 53 percent in the mixed conifer type and 40 percent in lodgepole pine stands. Table 17 displays the average canopy cover and range of canopy covers within the Lakes Basin Project area. The lower end of the range represents open canopy condition and the upper end represents more closed canopy conditions. Canopy cover was calculated using trees 6.0 inches DBH and greater.

The desired canopy cover for mature forest habitats outside of WUI defense zones in mature forest habitats (CWHR 4M, 4D, 5M, 5D, and 6) is a range of 30 to 60 percent, with a stand average between 40-50 percent to allow for adequate reduction of ladder fuels, provide sufficient spacing for safe and efficient equipment operations and minimize re-entry. It is desirable to have canopy openings throughout the project area in order to create early seral conditions dominated by shade-intolerant conifers. Within Northern goshawk protected activity centers (PACs) a reduction in canopy cover would allow for structural diversity, improved foraging habitat and sustainability of long-term nesting habitat. Where mature forest habitats occur within WUI defense zones, canopy cover would be reduced to effectively treat canopy fuels and reduce canopy continuity.

Table 17. Lakes Basin Project area canopy cover range and average

	Canopy Cover Range	Canopy Cover Average
Mixed Conifer	22-72%	53%
Lodgepole pine	23-56%	40%

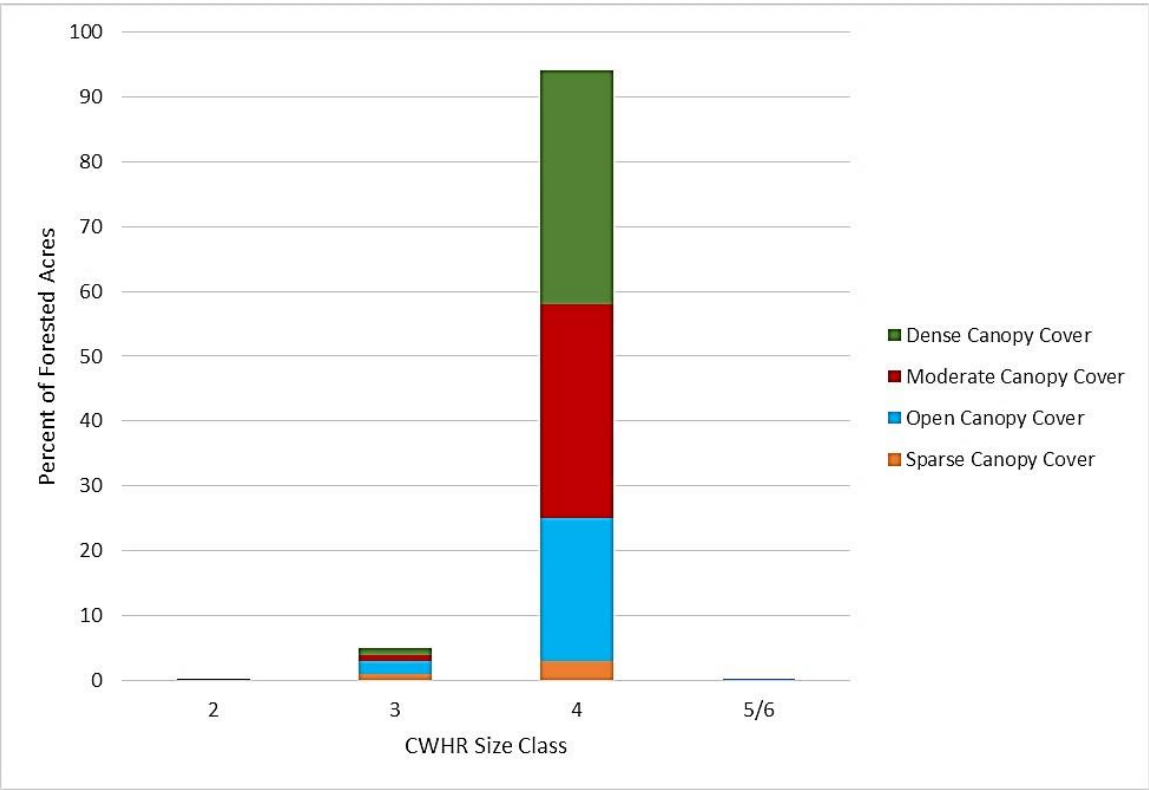

Figure 3. Percent distribution of CWHR size class of the forested vegetation within the Lakes Basin Project area.

Stand Density

Stand density affects tree growth rates and vigor; cover for wildlife; fuels and potential wildfire behavior; understory tree, shrub, and herb density; growth and yield of forest products. There is considerable evidence that the susceptibility of a stand to forest insects is related to its density. However, factors such as drought, root disease, mistletoe, and possibly air pollution also are important. Undoubtedly there is considerable interaction among these variables and stand density. During a severe drought, the effects of stand density may become paramount (Oliver et al. 1996). A method for reducing tree moisture stress and subsequent bark beetle activity is by reducing stand density with mechanical thinning and prescribed fire (North et al. 2009). Much of the forested area in the Lakes Basin Project area appears to be at or above “normal” stocking levels and in drier years have exhibited an elevated level of tree mortality caused by bark beetles. This mortality combined with high stand density has resulted in heavy fuel loading in many areas and a corresponding increase in fire danger (Cluck 2012).

Trees per acre (TPA) and basal area per acre (BA/A) were used to evaluate stand density. Table 18 displays average stand densities for mixed conifer and lodgepole pine stands. Within mixed

conifer stands there are approximately 586 TPA and an average basal area of 238 square feet per acre. When compared to historic densities in mixed conifer forests, which ranged from 27 to 65 TPA (Table 13), the current stand density could be described as overly dense. Within lodgepole pine stands there are approximately 320 TPA and an average BA of 192 square feet per acre.

Table 18. Average mixed conifer and lodgepole pine stand densities in Lakes Basin Project Area

	Average Trees Per Acre	Average Basal Area Per Acre
Mixed Conifer	586	238
Lodgepole Pine	320	192

At high stand densities such as those in the Lakes Basin Project area, growth slows down and tree vigor decreases. There is a high degree of competition within stands between trees for nutrients, water, growing space and sunlight. Cluck (USDA 2012), observed that overstocking is putting many stands at risk to high levels of bark beetle caused tree mortality during periods of drought and dense lodgepole pine stands are currently at risk to very high levels of mountain pine beetle caused mortality. More recent observations have noted that there has been an increased level of mortality of white fir due to the fir engraver (*Scolytus ventralis*) associated with the recent drought and in some instances high stand densities. Lodgepole pine dominated stands appear to be in an overstocked, high hazard condition and are susceptible to successful mountain pine beetle attacks. These stands have basal areas above 80-100 square feet per acre with many trees greater than 8.0-9.0 inches DBH.

Landram (USDA 2004d) developed insect risk thinning guidelines for the PNF based on basal area per acre, dependent upon average precipitation. Landram recommends thinning stands in the transition zone (30 to 45 inches average annual precipitation) to 150 square feet per acre of basal area and not exceeding 200 square feet after 20 years (USDA 2004d). It is suggested that stands in the westside zone (>45 inches average annual precipitation) be thinned to 200 square feet per acre of basal area and not exceeding 260 square feet after 20 years. A majority of mixed conifer stands where treatments are proposed receive an average of 30 to 50 inches of precipitation annually. Those at higher elevations receive greater than 50 inches annually. These stocking levels should reduce the density in most stands to a level that reduces inter-tree competition and the risk of bark beetle caused mortality.

Since a majority of mechanical thin units could be considered within the transition zone the desired post-treatment basal area is approximately 150 square feet per acre with an upper threshold basal area of 200 square feet per acre after 20 years. Those stands situated at higher elevations could retain higher post-treatment basal areas, approximately 200 square feet per acre with an upper threshold of 260 square feet per acre. The desired basal area for lodgepole pine stands is at or below 80 square feet per acre (Cluck 2012).

As mentioned under “Measurement Indicators”, an additional useful measure of stand density and a measure of stand vigor is Reineke’s Stand Density Index (SDI) and relative density. Relative

density describes a stand's density relative to SDImax and is expressed as a percentage. Table 19 lists some examples of situational appropriate limits of SDI.

Table 19. Examples of (situational) appropriate limits of Stand Density Index (SDI).

Circumstance	Desired Relative SDI
Maintain vigor, avoid self-thinning (density related mortality)	<60% SDImax
Delay self-pruning	<25% SDImax
Promote self-pruning/Onset of competition	>25% SDImax
Full site occupancy	>35% SDImax

The current average SDI for mixed conifer stands is 361 (Table 20), a relative density of 66 percent, indicating that stands are experiencing decreased vigor and have passed the lower limit of a self-thinning population. There is a high degree of inter-tree competition for nutrients, water, growing space, and sunlight. Considerable evidence exists that the susceptibility of stands to attack by a variety of insects is related to the decline in stand vigor with increasing density. Also, as stands become denser they become more susceptible to root disease, storm damage, and drought (Helms and Tappeiner 1996). The desired relative density is less than the sixty percent threshold (onset of density related mortality) for 20 years (USDA 2004c).

In lodgepole pine stands, the current SDI ranges from 167 to 372 with an average of 268. The desired SDI level is less than 170 (Cluck 2012). Managing lodgepole pine stands at densities not exceeding SDI 170 when 9 inch diameter trees are present apparently lowers the probability of serious mountain pine beetle attack (Cochran and Dahms 2000).

Table 20. Existing mixed conifer SDI and relative SDI.

Forest Type	Current Range of SDI	Current Average SDI	SDImax	Average Relative SDI (Range)
Mixed Conifer	144-536	361	550	66% (26-97%)

Stand Structure

The average existing diameter distribution for mixed conifer stands is displayed in Table 21 and Figure 4. These present a more traditional form of uneven-aged stand structure which was heavily reliant on achieving a reverse –J diameter distribution that reduced large-tree retention (**Figure 5**). Approximately 81 percent of the trees are biomass size or smaller and 19 percent are considered sawlog size trees and of those, the majority are classified by CWHR as small trees. The large number of small trees could be considered ladder fuels which contribute to surface fires transitioning to the canopy. Lodgepole pine stands have a similar diameter distribution, many small trees with scattered large trees (Table 22).

Table 21. Average diameter distribution in mixed conifer stands in Lakes Basin Project

CWHR Tree Size	Seedlings /Saplings	Saplings/ Poles	Small Trees		Medium-Sized Trees	Medium – Large Sized Trees	Total
Forest Product	**N/A**	**Biomass**	**Sawlog Trees**			**Reserve Trees**	
Diameter Class	0”-2.9”	3”-9.9”	10”-17.9”	18.0” -23.9	24”-29.9”	30”+	
Trees Per Acre	314	162	73	23	9	5	**586**
Basal Area Per Acre	4	35	75	53	33	38	**238**

Table 22. Average diameter distribution in lodgepole pine stands in Lakes Basin Project

CWHR Tree Size	Seedlings /Saplings	Saplings/ Poles	Small Trees		Medium-Sized Trees	Medium – Large Sized Trees	Total
Forest Product	**N/A**	**Biomass**	**Sawlog Trees**			**Reserve Trees**	
Diameter Class	0”-2.9”	3”-9.9”	10”-17.9”	18.0” -23.9	24”-29.9”	30”+	
Trees Per Acre	136	88	64	25	5	4	**320**
Basal Area Per Acre	1	19	73	59	17	24	**192**

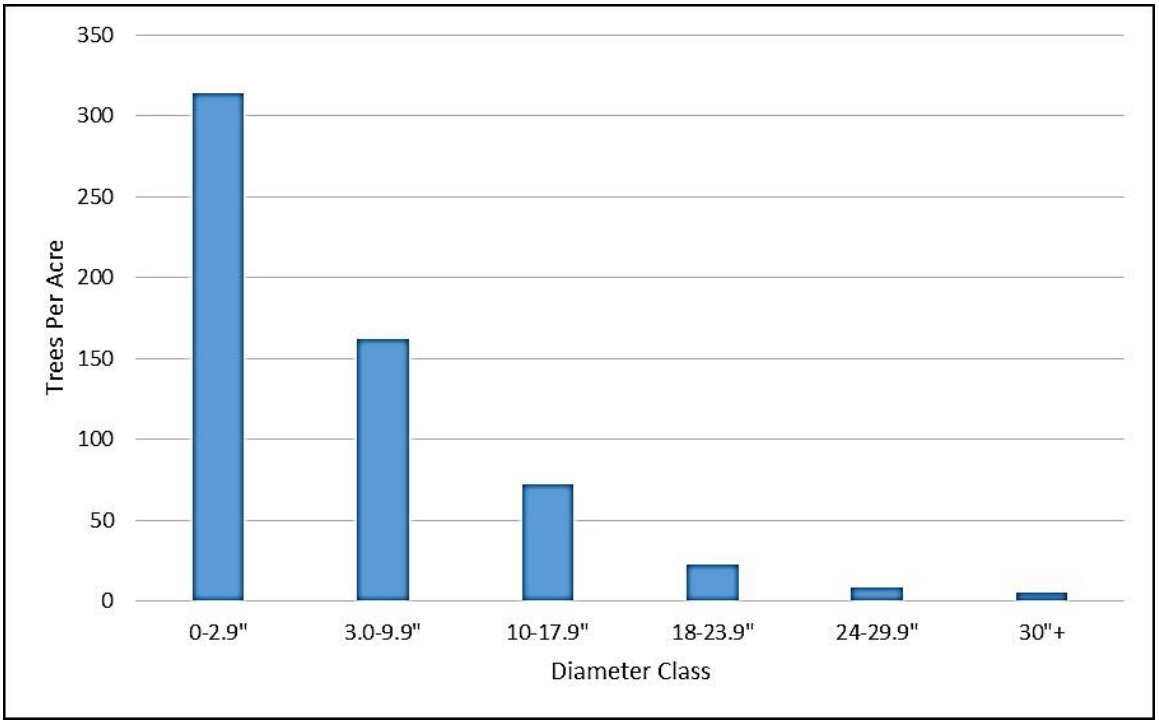

Figure 4. Existing diameter distribution in mixed conifer stands in Lakes Basin Project Area

The reverse-J diameter distribution shown in Figure 4 and **Figure 5** describes a stand structure with a surplus of small trees and limited space for large trees. Such a distribution is inconsistent with historical Sierra mixed-conifer forests where fire reduced the small-tree abundance while retaining fire resistant, large-diameter trees. Research suggests that fire-prone forests rarely had reverse-J diameter distributions (North et al. 2009). The existing diameter distribution may be

largely due to the interacting effects of timber harvest and fire suppression. Early selective cutting removed the large pine trees from many areas of YPMC forest, and with the long-absence of fire, natural succession has led to infilling by higher densities of young, mostly fire-intolerant species (Safford and Stevens 2017). Also, all of the Sierran reconstruction studies suggest that mixed-conifer forests, under an active fire regime, had a naturally clumped distribution containing a variety of size and age classes (Safford and Stevens 2017).

The desired diameter distribution, as suggested by North et al. 2009, is a more even distribution of size classes through reducing the proportion of small trees and increasing the proportion of large trees.

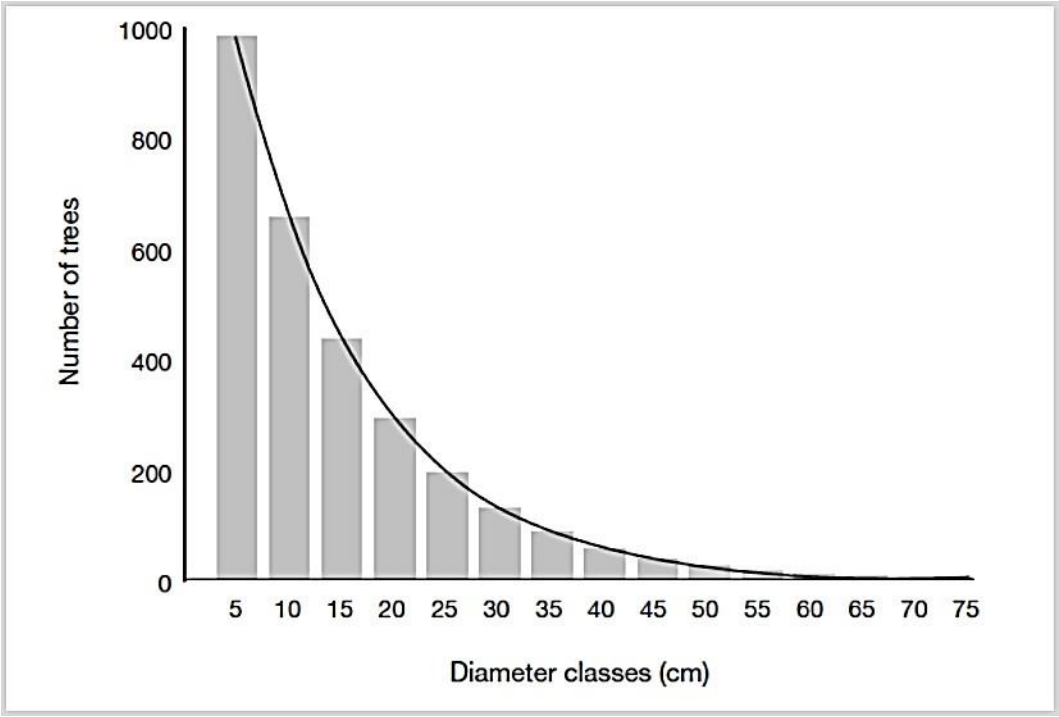

Figure 5. Traditional reverse-J curve.

Species Composition

Basal area can be used to infer overstory species composition as it is more heavily influenced by large diameter trees while trees per acre can infer understory species composition as it can be changed dramatically by small diameter trees.

Currently, mixed conifer stands are dominated by shade-tolerant conifers (white fir, incense cedar and Douglas-fir) in both the overstory and understory based on basal area per acre and trees per acre (Figure 6 and Figure 7 respectively). Shade-intolerant species (ponderosa pine/Jeffrey pine/sugar pine) share the overstory as scattered individuals and are poorly represented in the understory. On average shade-tolerant conifers make up approximately 74% of the current basal area and 91% of the number of trees. The high presence of shade-tolerant conifer species, which have created a self-perpetuating environment, indicates that a majority of these stands have shifted from historical conditions where shade-intolerant, drought and fire-

resistant pine species were dominant. This shift can be contributed to past activities such as fire suppression and selective logging. Lodgepole pine stands are dominated by lodgepole pine with lesser amounts of white fir and scattered Jeffrey pine in the overstory.

The desired condition for mixed conifer stands is to reduce the current amount of shade-tolerant species while maintaining species diversity, promoting shade-intolerant pines (sugar and ponderosa pine) and hardwoods (USDA 2004b). Retaining more drought-tolerant pine species, such as Jeffrey pine overall and Douglas-fir and incense cedar in the northern part of the Lakes Basin Recreation Area (LBRA), over white fir would increase species diversity and make stands more resilient to disturbance. Western white pine and sugar pine should be retained as much as possible during any thinning operation in order to preserve genetic diversity, especially white pine blister rust (*Cronartium ribicola*) resistant individuals (Cluck 2012). It is desirable to maintain species diversity within lodgepole pine stands and promote associated pine species.

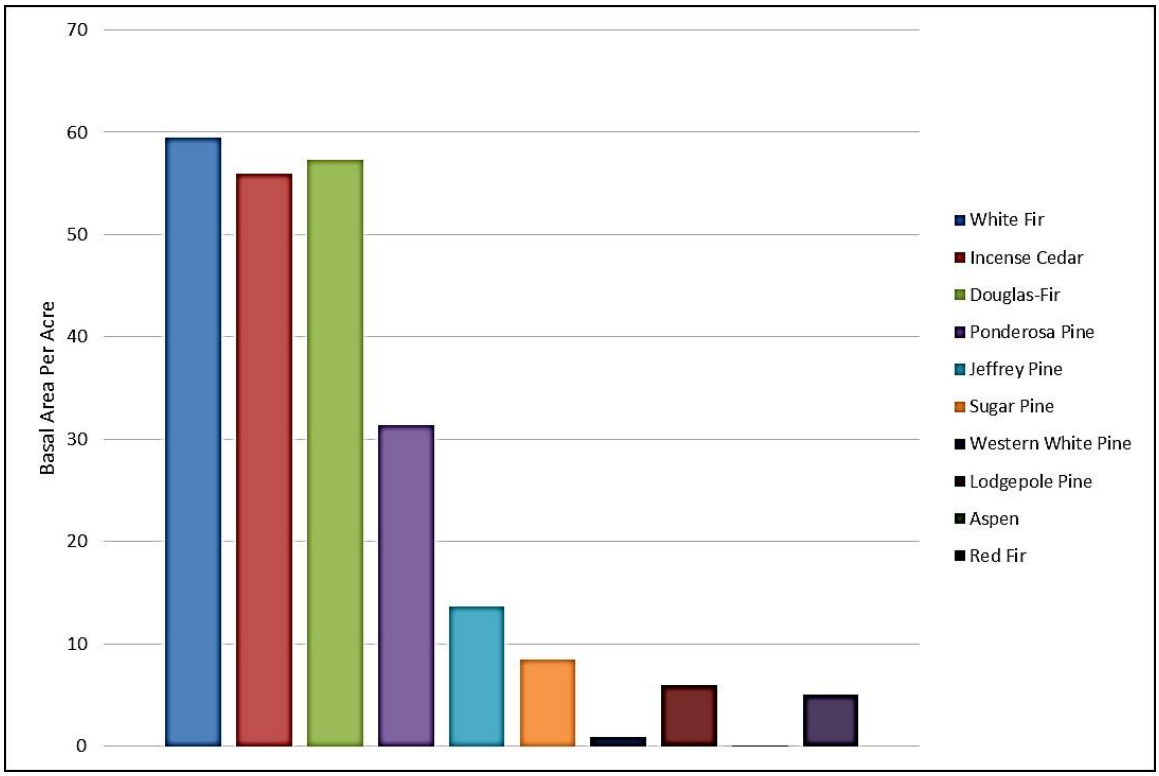

Figure 6. Current species distribution in mixed conifer stands based on Basal Area per Acre

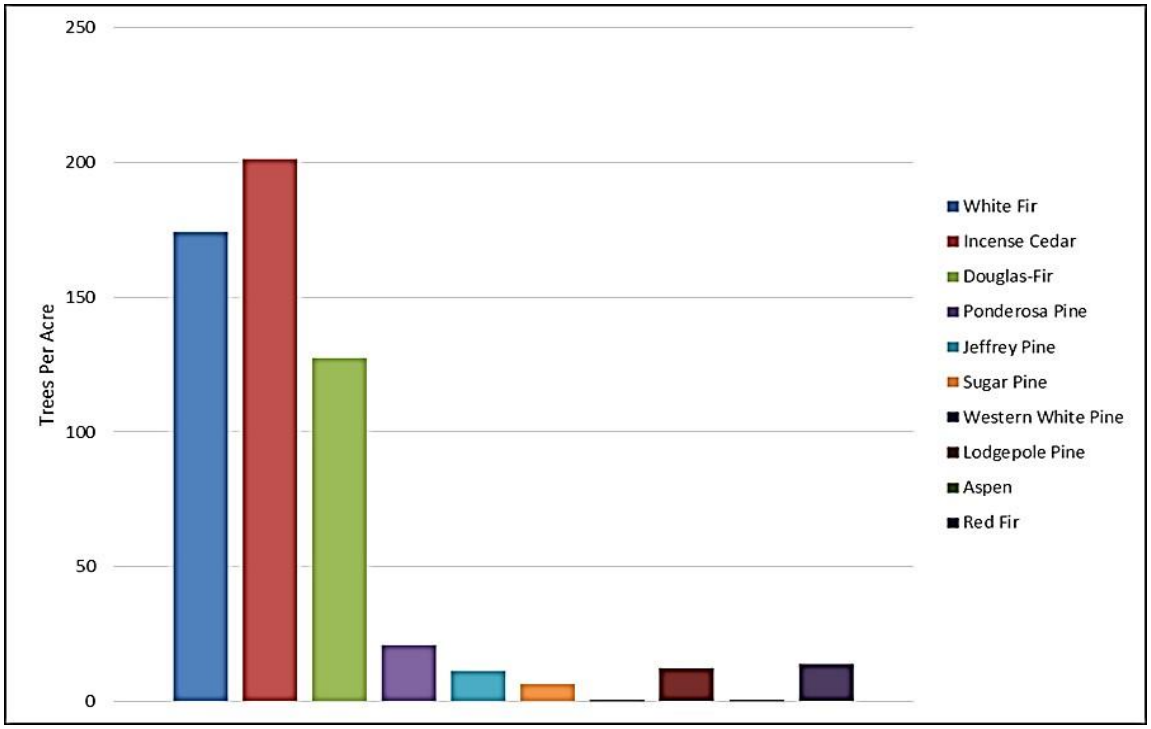

Figure 7. Existing species distribution in mixed conifer stands based on Trees per Acre.

Wildfire Hazard

In order to reduce wildfire hazard, treatments must change or remove wildland fuels in a way that lessens the likelihood of fire ignition, potential damage, or resistance to control. Fire hazard is the state of the fuel exclusive of weather or topography, is determined by the volume, condition, arrangement, and location of fuels. It is these parameters that treatment can affect, and so the overarching objective of reducing wildfire hazard is often broken down into subsidiary goals that include (Evans et al. 2011):

- reducing surface fuels
- increasing height to live crown (i.e. canopy base height)
- reducing canopy continuity (developing or maintaining canopy gaps)

Another goal would be to keep large trees of fire resistant species. Table 23 describes these subsidiary goals and their effects on fire behavior.

Table 23. Goals of reducing wildfire hazard and their effects and advantages*

Goal	Effect	Advantage
Reduce surface fuels	Reduces potential flame length	Control easier; less torching
Increase height to live crown	Requires longer flame length to begin torching	Less torching
Decrease crown density	Makes tree-to-tree fire less probable	Reduces crown fire potential
Keep big trees of resistant species	Less mortality for same fire intensity	Generally restores historic structure.

*(From Agee and Skinner 2005)

Currently, stands exhibit high canopy densities associated with dense stands and could support active crowning under severe conditions, with a potential loss of 81% of existing basal area. Stands have a low average canopy base height (influenced by seedlings, saplings, and pole size trees), which provides a pathway for surface fires to transition to the canopy. Also, the probability of torching is approximately 43%. The probability of torching (P-Torch) is the estimated probability of finding a torching situation in a forest stand. A torching situation is generally defined as one where tree crowns of significantly large trees are ignited by the flames of a surface fire or flames from burning crowns of small trees that reach larger trees (Rebain 2010). Table 24 displays the wildfire hazard indices and impact of fire for stands within the Lakes Basin Project area. The desired condition is one where there is an increase in crowning index and canopy base height and a decrease in P-Torch, flame length and canopy densities so that there would be a significant decrease in the amount of basal area mortality.

Table 24. Existing wildfire hazard indices for stands within Lakes Basin Project Area.

	Crowning Index (mph)	Flame Length (Feet)	Probability of Torching (P-Torch) (%)	Canopy Base Height (Feet)	Canopy Density (kg/m^2)	Basal Area Mortality (%)
Sierra Mixed Conifer	21	43	43	5	.128	81
Lodgepole Pine	20	36	36	8	.119	83

Environmental Consequences

Alternative 1 – Proposed Action

Direct and Indirect Effects of Treatments to Improve Forest Health

Under Alternative 1 (Proposed Action) the Lakes Basin Project proposes to implement mechanical thinning, hand thinning, hand piling, grapple piling, pile burning, and underburning.

Mechanical Thinning – Effects on General Forest and Wildland/Urban Interface

Stand Density

A direct effect of mechanical thinning proposed in Alternative 1 would be the reduction of tree densities in treated areas (Table 25). The reduction of tree densities would move stands closer to historic trees per acre as displayed in Table 13. Over time, stand densities would increase as natural tree regeneration occurs. The amount of tree regeneration and species that become established would be influenced by residual canopy cover, future precipitation patterns, and disturbance. Subsequent underburning post-treatment and over time would assist in maintaining lower levels of naturally occurring tree regeneration. This would minimize the need for follow-up hand thinning treatments to address future stand densities and ladder fuels represented by smaller trees.

Table 25. Existing Trees per Acre and modeled effect of mechanical thinning on Trees per Acre over time after treatment in WUI defense Zone and General Forest in the Lakes Basin Project Area

Years	Trees Per Acre in WUI Defense Zone*	Trees Per Acre in General Forest*
Existing	311	297
0- (Immediate Post-Treatment)	52	84
10	54	84
20	62	89

*Does not include trees less than 3.0 inches DBH

Average stand basal area would be reduced to approximately 120 square feet per acre in WUI defense zones and 182 square feet in general forest stands. Table 26 displays the modeled basal area for proposed mechanical thin units in WUI defense zones and in general forest. Within WUI defense zones, mechanical thinning would meet the desired basal area of 150 square feet per acre and after twenty years remain below the upper limit of 200 square feet per acre of basal area associated with insect risk thinning guidelines. On average, mechanical thinning in general forest would initially reduce basal area to approximately 182 square feet per acre, below the upper threshold but not down to the desired target. This can be attributed to the high amount of residual basal area post-treatment represented by medium and large trees in many stands and increased growth. After 10 years BA would increase and on average stands would begin to exceed the upper threshold, potentially increasing the risk to insects. After 20 years all stands within general forest would exceed the upper limit. However, the reduction in tree densities would increase available growing space and decrease competition, improving tree growth, vigor and defense mechanisms towards insects and allow for the reintroduction of fire.

Table 26. Modeled effect of mechanical thinning on Basal Area over time in WUI defense zone and general forest in the Lakes Basin Project Area

Year	Average Basal Area* (Range) WUI Defense Zone	Average Basal Area* (Range) General Forest
Existing Average	274 (152-343)	263 (196-343)
0-(Immediate Post-Treatment)	120 (104-147)	182 (154-220)
10	135 (129-156)	203 (182-240)
20	157 (143-171)	232 (216-254)

*Square feet per acre.

Another effect of mechanical thinning would be the reduction of relative stand densities below the 60 percent threshold where the onset of density related (self-thinning) mortality occurs and tree vigor is maintained. On average, mechanical thinning would initially reduce relative stand densities to 28 percent in WUI defense zones and 46 percent in general forest (Table 27). For both WUI and general forest acres the average relative density is expected to stay below 60 percent with some stands outside of the WUI nearing the lower limit of self-thinning after 20 years. Proposed actions within the WUI would decrease relative densities below full site occupancy (<35% relative density) to effectively treat fuels and modify potential wildfire

behavior. Mechanical thinning would meet the Regional direction in maintaining stand densities at a level below 60 percent of maximum density for at least twenty years after initial treatment (USDA 2004c). The modeled relative densities also relate to historical estimations of similar vegetation types (Table 13).

Table 27. Modeled effect of mechanical thinning on relative Stand Density Index in WUI defense zone and general forest in the Lakes Basin Project Area.

Year	WUI Defense Zone	General Forest
	Average Relative SDI-550 max (range)	Average Relative SDI-550 max (range)
Existing Average	76% (43-97%)	73% (55-97%)
0-(Immediate Post-Treatment)	28% (26-33%)	46% (39-54%)
10	31% (29-34%)	48% (44-57%)
20	36% (33-37%)	54% (49-59%)

Stand Structure

The majority of trees to be removed are small trees less than 24.0 inches DBH which are in the suppressed, intermediate and codominant crown classes in addition to biomass size trees. Crown class is a category of tree based on its crown position relative to those of adjacent trees (Helms 1998). The removal of trees >24 inches DBH to <30 inches DBH would occur in limited situations where the removal would shift stands towards the desired conditions in terms of fuels reduction, forest structure and species composition, e.g. an undesirable shade-tolerant species directly competing with a healthy vigorous individual or clump of desired shade-intolerant species. In general, mechanical thinning would shift diameter distribution away from a reverse J-curve dominated by small trees and move towards a distribution with higher proportions of larger trees (**Figure 8**). Table 28 displays diameter distribution for WUI defense zone and Table 29 for general forest treatment units. This is a positive shift towards desired condition of a more even distribution of size classes (Figure 2), especially when compared to the existing and predicted future condition of the No-action Alternative (Table 41 and Table 42). The reduction in trees smaller than biomass can be correlated with implementation activities (mechanical equipment) and secondary activities (grapple pile, hand thin, underburn).

In general, forest structure would shift from dense, homogenous stands with high populations of small trees into more diverse stands with a more balanced range of diameter classes and increased stand level heterogeneity. An increase in stand heterogeneity may reduce the occurrence of high levels of bark beetle-caused tree mortality while maintaining endemic (low) levels. Research suggests that posttreatment tree density may be the best predictor of subsequent levels of bark beetle caused tree mortality. Thinning not only affects the vigor of residual trees, influencing resin chemistry, flow, and oleoresin exudation pressure, but also the physical environment within treated stands. In contrast, forested landscapes that contain little heterogeneity promote the creation of large contiguous areas susceptible to bark beetle

outbreaks (North 2012). Where treatments occur in Northern goshawk PACs, higher densities of trees (associated with higher canopy cover) would be retained adjacent to nest core sites.

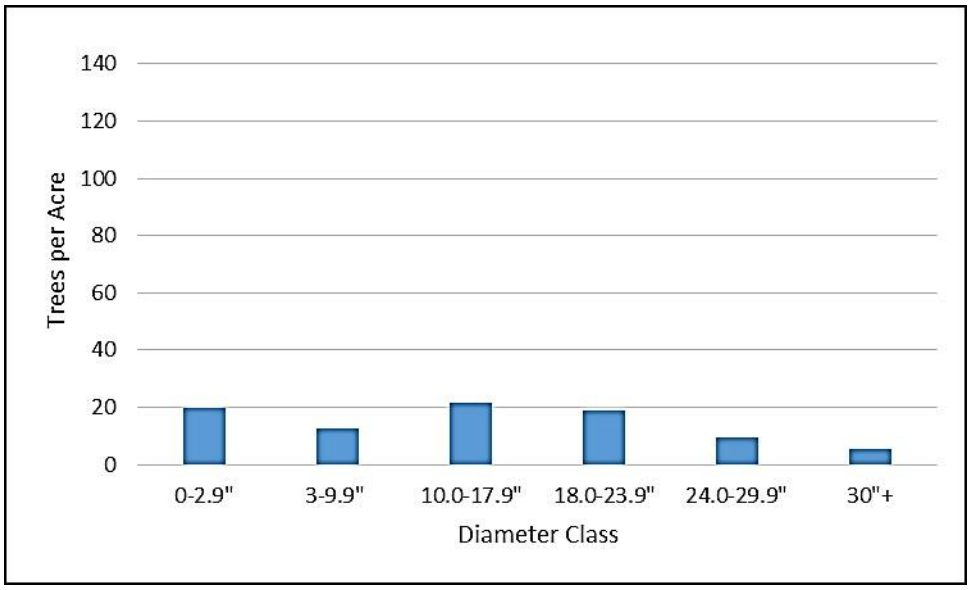

Figure 8. Mechanical thin average diameter distribution post-treatment for the Lakes Basin Project.

Table 28. Modeled effect of mechanical thinning on diameter distribution over time in WUI defense zone for Lakes Basin Project Area.

Year	3”-9.9”	10”-17.9”	18.0” - 23.9	24”-29.9”	30”+	Average TPA*
Existing Average	193	75	25	12	6	311
0-(Immediate Post-Treatment)	12	15	10	9	6	52
10	14	13	8	11	8	54
20	21	10	9	11	11	62

*Does not include trees less than 3.0 inches DBH

Table 29. Modeled effect of mechanical thinning on diameter distribution over time in General Forest for Lakes Basin Project Area.

Year	3”-9.9”	10”-17.9”	18.0” - 23.9	24”-29.9”	30”+	Average TPA*
Existing Average	174	83	26	9	5	297
0-(Immediate Post-Treatment)	13	28	28	10	5	84
10	9	25	29	14	7	84
20	15	19	27	17	11	89

*Does not include trees less than 3.0 inches DBH

Also, in addition to reducing overall stand densities mechanical thinning would create canopy openings and retain dense clumps of trees, contributing to a heterogeneous stand structure. Canopy openings would create favorable conditions for shade-intolerant conifer regeneration and encourage their recruitment and growth. Over time, trees that establish themselves in

canopy openings would grow into new age classes. It is expected a combination of shade-tolerant and shade-intolerant tree species would become established in the understory of the matrix and dense clumps. However, tree recruitment and establishment would heavily rely on subsequent underburning, future precipitation patterns and projected climate change.

Species Composition

On average shade-tolerant conifers make up approximately 74 percent of the current basal area and 91 percent of the number of trees. Within general forest units, mechanical thinning reduces overall stand densities, however, due to diameter limits and canopy cover and basal area retention guidelines, species composition would only slightly shift towards desired conditions (Figure 9). Although shade-tolerant species would be prioritized for removal they would still be dominant in the overstory and comprise a majority of basal area. Nonetheless, mechanical thinning would reduce the average existing amount of shade-tolerant trees that currently exists (approximately 517 TPA, Table 47) by 85 percent to an estimated 79 TPA, including trees less than 3.0 inches DBH. This results from mechanical thinning operations which would remove many of the smaller trees in the understory in addition to underburning which may cause mortality to existing tree regeneration. Shade-tolerant species would continue to dominate stands over time and regenerate in the understory. However, the creation of canopy openings adjacent to shade-intolerant trees (seed sources) would provide opportunity and create conditions favorable to the regeneration and growth of shade-intolerant tree species and would help shift future species composition closer towards desired conditions.

Within WUI defense zones there would be a greater shift in species composition towards desired conditions (Figure 10). Stands within the WUI have a greater proportion of shade-intolerant species in the overstory but are still dominated by shade-tolerant species. There is a greater shift than what occurs in general forest units since canopy cover and basal area guidelines are not applicable to WUI defense zones. Mechanical thinning would reduce the average existing amount of shade-tolerant conifers that currently exists as smaller trees in the understory and codominant overstory trees. Also, underburning may cause mortality to existing tree regeneration. A more favorable environment for maintaining fire resistant shade-intolerant tree species is created with a greater reduction in canopy cover, the creation of canopy openings and an increased proportion of shade-intolerant tree species in the overstory.

Overall, the composition would be improved from current conditions and increase stand level species heterogeneity. Marking prescriptions would promote shade-intolerant pines and focus on retaining basal area generally comprised of the largest trees (USDA 2004b).

Wildfire Hazard

The purpose of analyzing wildfire hazard is to assess if treatments affect potential wildfire behavior and effects. Vegetation treatments occurred in year 0 with a prescribed fire taking place between years 0 and 10. Table 30 and Table 31 display existing and post-treatment measurement indicators for WUI defense zone and general forest respectively.

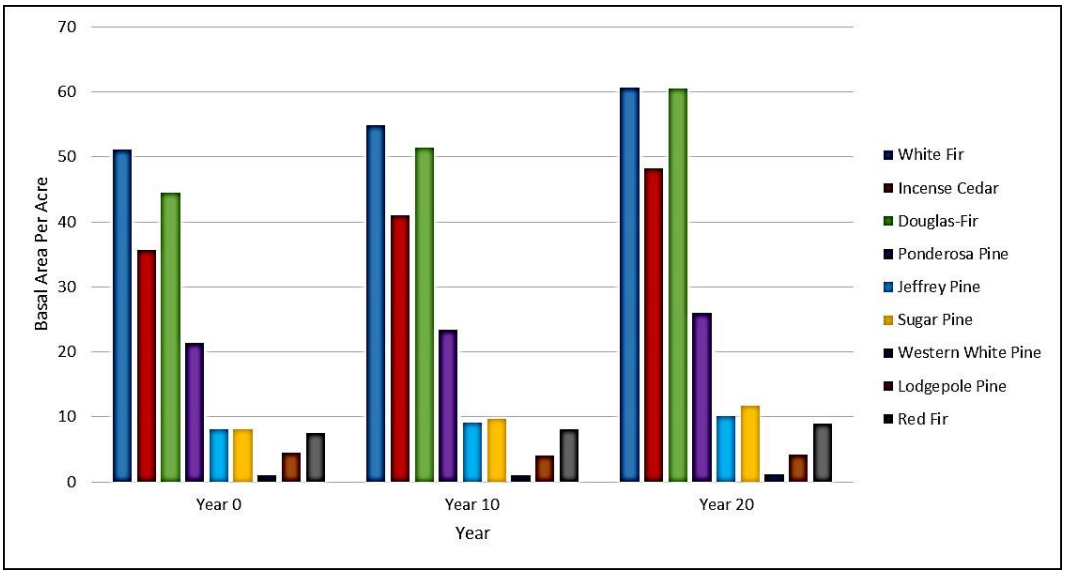

Figure 9. Effect of mechanical treatment on species composition in general forest in the Lakes Basin Project.

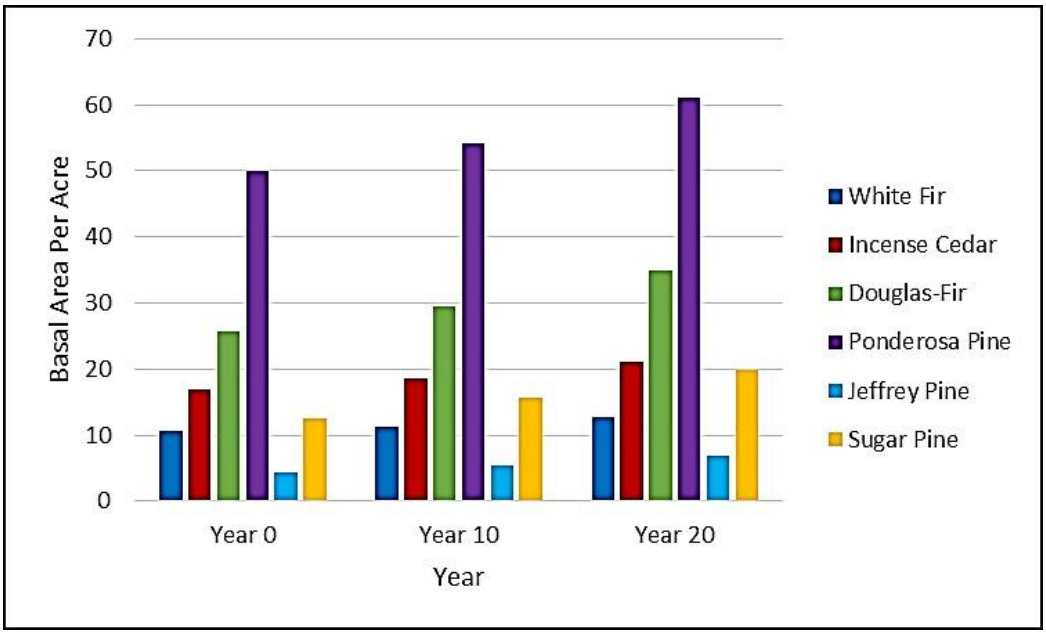

Figure 10. Effect of mechanical treatment on species composition in WUI defense zone in the Lakes Basin Project.

The direct effect of the proposed actions would be a change in stand structure as indicated by the change in canopy base height and canopy density. The change in canopy density would increase the crowning index, the 20-foot wind speed needed to support an active crown fire. Average canopy base heights would increase, due to the removal of smaller trees, which indicates a lower chance of a surface fire transitioning into the canopy. Also, the probability of torching significantly decreases, from a range of 28-34 percent to 1-6 percent. The most significant change is the decrease in the potential mortality of existing basal area. Treatments in

both WUI defense zones and general forest have beneficial effects, the greatest effect is associated with WUI defense zones. Since canopy cover and basal area guidelines are not applicable to WUI defense zones there is a greater ability to decrease canopy continuity and canopy density. Within general forest, the implementation of VDT prescriptions would create a mosaic of tree/canopy densities and the creation of canopy gaps would assist in breaking up canopy continuity. After 20 years, modeled wildfire hazard indices show that the proposed treatments would continue to be effective. Canopy base height could be influenced by future tree regeneration which could impact crown fire hazard and the probability of torching. However, tree regeneration would be affected by subsequent underburning post-treatment and over time, future precipitation patterns, and climate change.

Table 30. Effect of mechanical thinning on wildfire hazard indices in WUI defense zone in the Lakes Basin Project Area.

Year	Crowning Index (mph)	Flame Length (Feet)	Probability of Torching (%)	Canopy Base Height (Feet)	Canopy Density (kg/m^2)	Basal Area Mortality (%)
Existing	20	42	34	8	.137	75
0	51	4	<1	41	.03	7
10	50	6	1	49	.03	6
20	49	6	1	51	.03	6

Table 31. Effect of mechanical thinning on wildfire hazard indices in General Forest in the Lakes Basin Project Area.

Year	Crowning Index (mph)	Flame Length (Feet)	Probability of Torching (%)	Canopy Base Height (Feet)	Canopy Density (kg/m^2)	Basal Area Mortality (%)
Existing	17	56	28	5	.154	89
0	25	13	6	24	.096	31
10	26	11	4	38	.087	19
20	27	12	1	44	.086	18

Project Level Heterogeneity

Implementation of VDT prescriptions would improve heterogeneity within the project area by maintaining dense clumps of trees, creating canopy openings and leaving variable tree retention levels within the matrix. This mosaic would improve the project areas resilience to disturbances such as insects and wildfire in addition to climate change. Canopy openings and retention of dense clumps of trees would improve seral stage distribution at the stand level and project level.

A majority of stands where mechanical treatments are proposed are CWHR size class 4 (11.0-24.0 inches DBH size trees) and in density classes M (40-59% canopy cover) and D (60% plus

canopy cover). A direct effect of mechanical thinning would be the reduction of canopy cover (Table 33 and Table 34). Mechanical thin stands within the WUI would shift from CWHR density classes M/D to class P (25-39% canopy cover). General forest stands in density class M would remain as M while density class D stands would shift to density class M. Table 32 displays density class shifts associated with mechanical thinning. Density class shifts are based on average stand level canopy cover and do not reflect the creation of canopy openings at the sub-stand level. Over time, canopy cover would increase and stands would gradually shift to the next density class as portrayed in Table 33 and Table 34. A reduction in canopy cover would improve conditions for the recruitment of shade-intolerant conifers.

Table 32. Effect of mechanical thinning on CWHR density class in the Lakes Basin Project.

Year	CWHR Density Class					Total Acres
	D	M	P	S	N/A	
Existing	2,949	2,770	1,886	377	4,692	**12,674**
Year 0	1,862	3,497	2,246	377	4,692	**12,674**
Change	1,087	-727	-360	0	0	**0**

There would be an increase in quadratic mean diameter (QMD) post treatment and a continued increase through at least 20 years (Table 33 and Table 34). The immediate increase is due to the removal of smaller trees and the increase over time due to improved growth and vigor. On average, a majority of stands would stay in a mid-seral condition based on QMD but the amount of time to reach a late seral condition (CWHR size class 5) would be reduced by the proposed action. Early seral conditions would be created at the fine scale by the creation of canopy openings utilizing VDT implementation. Canopy cover and QMD were calculated using trees greater than or equal to 6.0 inches DBH.

Table 33. Effect of mechanical thinning on average canopy cover and quadratic mean diameter (QMD) in WUI defense zone in the Lakes Basin Project Area.

Year	Mechanical Thinning	
	Canopy Cover (Range)	QMD (Range)
0 – (Immediate Post-treatment)	31% (29%-36%)	21.7” (19.2” – 25.4”)
10	33% (31%-37%)	24.1” (22.0”-24.5”)
20	37% (37%-48%)	24.9” (21.3”-29.4”)

Table 34. Effect of mechanical thinning on average canopy cover and quadratic mean diameter (QMD) in General Forest in the Lakes Basin Project Area.

Year	Mechanical Thinning	
	Canopy Cover (Range)	QMD (Range)
0 – (Immediate Post-treatment)	42% (40%-46%)	20.1" (17.0"-23.6")
10	44% (40%-49%)	22.2" (19.5"-25.6")
20	46% (41%-52%)	24.9" (21.3"-29.4")

At the landscape scale, the maintenance of a mosaic of different stand structures, densities and compositions may reduce the frequency and extent of bark beetle outbreaks. Management that increases spatial diversity of forest conditions with variable tree density, species diversity and growth rates may retain the ecological benefits of chronic bark beetle impacts without facilitating episodic, large scale tree mortality that historically may have been rare in much of the Sierra Nevada (North 2012).

A management strategy that encourages forest heterogeneity at multiple scales would improve in general, habitat quality, landscape connectivity and disturbance resilience (North et al. 2009).

Recreation Sites

The direct and indirect effects of mechanical thinning in stands adjacent to selected recreation sites would mirror those of mechanical thinning of general forest.

The effects of mechanical thinning in established recreation sites would be the reduction of tree densities associated with hazard tree removal and a decrease of ladder fuels. Species composition, relative stand density, and heterogeneity would not necessarily be improved since the focus of removal is to modify fuels and reduce hazard trees. The reduction of hazardous fuels may be achieved by initially applying hazard tree guidelines. Prescriptions would entail leaving a balance of trees and structure to maintain or improve the recreation experience while reducing hazards to the public. Over time the continued creation of hazard trees exists dependent on insect activity, tree pathogens, climate change and human interaction.

Grapple Piling, Hand Thinning, and Hand Piling in WUI Defense Zones and General Forest

Grapple piling, hand thinning, and hand piling is proposed on 187 acres in WUI defense zones and 683 acres in general forest units (Appendix B Figure 14. Lakes Basin Project Alternative 1 Proposed Treatments). The proposed treatments would reduce tree densities in the smaller diameter classes, decrease competing vegetation and lower surface fuel loading. These activities would be tailored to achieve VQOs within areas designated by the 1988 PNF LRMP as visual retention and partial visual retention management prescriptions. Table 5 and 6 display the design criteria associated with mechanical thinning under the Proposed Action.

Grapple Piling

A direct effect of grapple piling would be the modification of potential wildfire behavior, reduction of small trees less than 3.0 inches DBH , reduction of surface fuels (live brush, dead and down material) and breaking up surface fuel continuity. The reduction in competing

vegetation would improve the vigor and growth of residual trees. Over time, a new age class of brush and trees would become established, contributing to heterogeneity. However, the re-establishment of brush could increase hazardous wildfire behavior and may warrant additional treatments.

Hand Thin with Grapple Piling or Hand Piling

Stand Density

Hand thinning treatments would reduce tree densities by removing conifer trees less than 11.0 inches DBH. After initial treatment the overall average TPA in mixed conifer is expected to be around 131 and 115 in lodgepole pine stands (Table 35). TPA would increase over time due to the establishment of natural regeneration within the understory. Tree recruitment would be influenced by residual canopy cover, future disturbances and precipitation patterns. Stand densities may be further reduced slightly due to mortality associated with pile burning activities.

Table 35. Modeled effect of hand thinning on stand densities (Trees per Acre) over time since treatment in Lakes Basin Project Area.

Year	Mixed Conifer	Lodgepole Pine
Existing	427	317
0- (Immediate Post-Treatment)	131	115
10	166	151
20	158	146

As expected, there is a corresponding reduction in the average BA as a result of hand thinning (Table 36). Treatments would not greatly reduce basal area because small trees only slightly contribute to total stand basal area. Treatments in mixed conifer would initially reduce the average basal area below the desired basal area of 150 square feet per acre, with all stands below the upper threshold basal area of 200 square feet per acre, decreasing the potential risk of insect occurrence. Over time, some stands would begin to exceed the upper boundary of the desired range thus elevating their risk to insect attack. Treatments in lodgepole pine stands would not reduce stand densities to the desired 80 square feet per acre of basal area since only small trees are proposed for removal. But, the reduction in tree densities would tend to positively affect growth (an increase in basal area) and vigor by decreasing competition for limited resources including available water, nutrients and growing space.

Table 36. Modeled effect of hand thinning on stand densities (Basal Area) over time since treatment in Lakes Basin Project Area.

Year	Average Basal Area* (Range) Mixed Conifer	Average Basal Area* (Range) Lodgepole Pine
Existing	162 (111-221)	194 (112-255)
0-(Immediate Post-Treatment)	148 (100-193)	179 (98-245)
10	176 (113-220)	198 (117-260)
20	203 (130-243)	218 (141-275)

*Square feet per acre

After hand thinning, mixed conifer stands are expected to have an average relative density of 37 percent, ranging from 21 to 47 percent (Table 37). Hand thinning is usually prescribed to stands that are generally comprised of small trees (seedlings, saplings, poles) with fewer overstory trees. Therefore, many stands currently have not exceeded the threshold relative density. However, the reduction of tree densities would decrease current relative density and over the next twenty years maintain an average that is below the 60 percent threshold.

Since few trees that comprise the overstory would be removed, lodgepole stands would remain over the desired SDI of 170 with an average SDI of approximately 254. By removing some lodgepole pine greater than 8.0 inches DBH and retaining other species such as white fir and red fir where it exists would make thinning treatments more effective in preventing future bark beetle caused mortality (Cluck 2012).

Thinning treatments, especially on mixed conifer sites, would increase tree vigor, growth, resiliency to disturbance, and resistance to potential insect attacks.

Table 37. Modeled effect of hand thinning on relative densities (SDI) of mixed conifer forest over time since treatment in Lakes Basin Project Area.

Year	Mixed Conifer
	Average Relative SDI-550 max (range)
Existing	44% (27-61%)
0-(Immediate Post-Treatment)	37%% (21-47%)
10	43% (25-53%)
20	49% (29-59%)

Stand Structure

Since hand thinning treatments remove conifer trees less than 11.0 inches DBH, there would be a substantial reduction of trees in those size classes. These smaller trees compete for available growing space, nutrients, sunlight and act as ladder fuels contributing to potential wildfire hazard. The total number of trees less than 10.0 inches DBH is expected to average around 65 TPA in mixed conifer (Table 38) and 22 TPA in lodgepole pine stands (Table 39). Fewer trees, less than 11.0 inches DBH, would remain in lodgepole pine stands since those stands have a higher number of trees larger than 11.0 inches DBH. Removing a majority of trees in the smaller diameter classes would shift the major proportion of trees sizes up to the larger-sized diameter classes. For mixed conifer stands, this is more representative of historic conditions. Through species retention, desired shade-intolerant conifers would be retained whenever possible over shade-tolerant trees.

Table 38. Modeled effect of hand thinning on diameter distribution (TPA) over time since treatment in mixed conifer stands in Lakes Basin Project Area.

Year	0”-2.9”	3”-9.9”	10”-17.9”	18.0” -23.9	24”-29.9”	30”+	Average TPA
Existing	241	120	43	13	4	6	427
0-(Immediate Post-Treatment)	34	31	43	13	4	6	131
10	51	43	42	17	6	7	166
20	27	55	38	20	10	8	158

Table 39. Modeled effect of hand thinning on diameter distribution (TPA) over time since treatment in lodgepole pine stands in Lakes Basin Project Area.

Year	0”-2.9”	3”-9.9”	10”-17.9”	18.0” -23.9	24”-29.9”	30”+	Average TPA
Existing	136	88	64	25	5	4	320
0-(Immediate Post-Treatment)	5	17	59	26	4	4	115
10	43	13	56	27	7	5	151
20	40	10	46	34	10	6	146

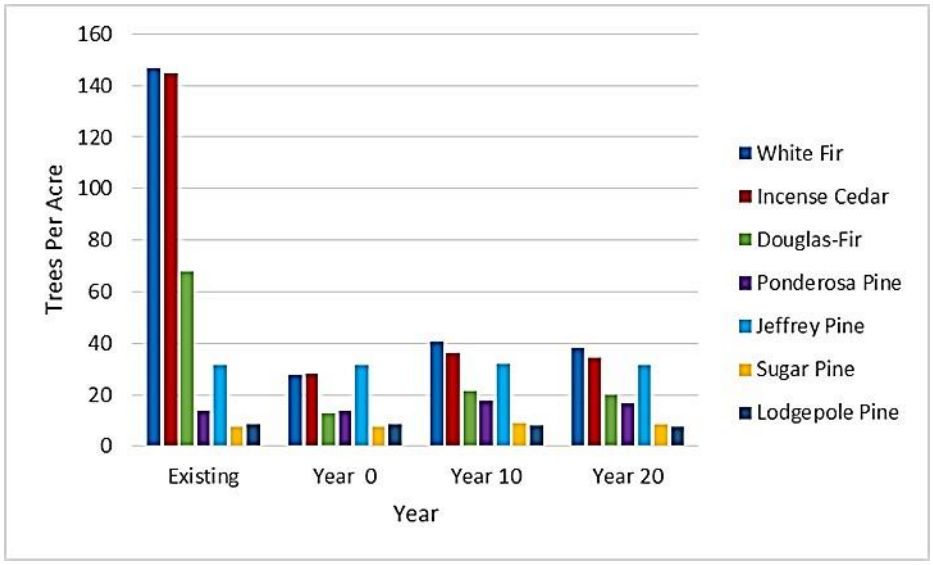

Figure 11. Modeled effects of hand thinning on Trees per Acre by species over time in mixed conifer stands in the Lakes Basin Project.

Species Composition

Hand thinning treatments would also help shift species composition in treated areas, especially in mixed conifer stands. By preferentially removing shade-tolerant species over desired shade-intolerant species, treatments would shift the general composition of stands towards a more desired condition based on TPA (Figure 11). Hand thinning treatments would reduce the existing amount of shade-tolerant conifers by approximately 80 percent to an average of 69 TPA.

However, since hand thinning only reduces trees less than 11.0 inches DBH, there is not significant reduction in BA represented by shade-tolerant species. Initially after treatment, shade-tolerant conifers would continue to occupy more space. Jeffrey pine would continue to be a dominant component of the overstory (Figure 12) but may decrease over time due to natural mortality. Also, some mortality due to pile burning may occur decreasing tree representation in the biomass or smaller size classes. TPA would increase over time due to the establishment of natural regeneration in the understory. It would be expected that primarily shade-tolerant conifers would regenerate and become established due to a dense residual overstory. Tree recruitment and establishment would be influenced by future disturbances and precipitation patterns.

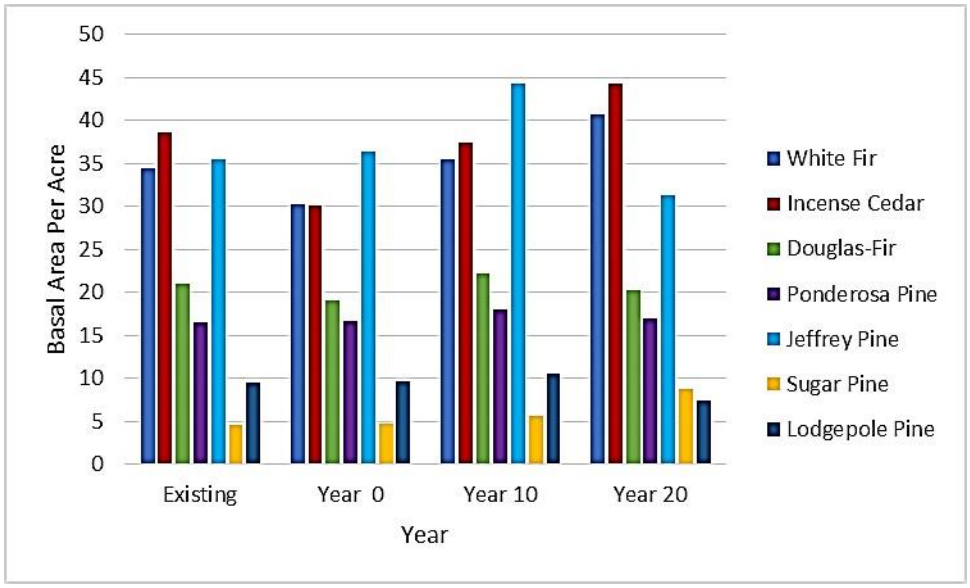

Figure 12. Modeled effects of hand thinning on Basal Area per Acre by species over time in mixed conifer stands in the Lakes Basin Project.

In lodgepole pine stands the effects would be similar in regards to a reduction of conifer trees less than 11.0 inches in diameter and a minimal reduction in BA. A species mix of lodgepole pine, red fir, and white fir would be maintained. Lodgepole pine is a prolific seed producer (Burns and Honkala 1990) and expected to maintain itself over time.

Overall, because hand thinning treatments do not remove trees greater than 11.0 inches DBH, it mainly has a direct effect on the understory species composition and not the overstory. Also, most of the effect would be in the actual number of trees and not the distribution by volume (BA).

Wildfire Hazard

A direct effect of hand thinning in mixed conifer stands would be the reduction of small trees acting as ladder fuels, increasing the canopy base height and the resistance to surface fires transitioning to the crown. Hand thinning would also reduce the potential for torching (Table 40). Crowning index would only slightly increase since the reduction of tree densities is primarily associated with understory trees. With the implementation of hand thinning it would be

expected that the potential loss of existing basal area would be greater than half were a fire to occur under severe conditions, a slight reduction compared to existing conditions. Activity generated material and existing material would either be hand piled or grapple piled, reducing surface fuel continuity. Pile burning may cause scattered mortality due to scorch. Average canopy base height is expected to increase with an increase in growth to residual trees but decrease after ten years as tree regeneration becomes established and grows. Potential torching doesn't necessarily increase since tree regeneration may not be continuous in the understory. It is expected that the effects would be similar where hand thinning occurs in lodgepole pine stands.

Table 40. Effect of hand thinning on potential wildfire hazard indices in mixed conifer stands in Lakes Basin Project Area.

Year	Crowning Index (mph)	Flame Length (Feet)	Probability of Torching (%)	Canopy Base Height (Feet)	Canopy Density (kg/m^2)	Basal Area Mortality (%)
Existing	32	21	73	4	.07	73
0	37	16	38	14	.06	55
10	37	15	30	19	.06	44
20	35	16	25	14	.07	41

Project Level Heterogeneity

Although hand thinning treatments directly affect the understory of treated areas, it usually leaves the overstory intact. Only by treating larger diameter trees would there be changes to canopy cover. As a result, the average canopy cover in mixed conifer stands remains similar to the existing condition with a slight decrease of canopy cover represented by trees 6.0 to 11.0 inches in DBH. There would be no shift in CWHR density classes where hand thinning is proposed. The reduction of small diameter trees would only slightly increase the QMD of trees greater than or equal to 6.0 inches DBH since the majority of trees removed are less than 6.0 inches DBH. Therefore, a majority of stands would remain in CWHR size class 4.

Overall, size class and density class would not be altered enough to cause a shift to a class above or below the existing condition. However, removing smaller trees would increase general resilience to disturbance such as insects, disease and fire in addition to climate change. A reduction in stand density would have a positive effect on stand vigor and growth.

Underburning

The underburn only treatment area is dominated by non-forested vegetation. Approximately 57 percent of the proposed area is comprised of montane chaparral. Other vegetation types include mixed conifer, red fir, lodgepole pine, subalpine conifer, and Jeffrey pine. There would be no manipulation of forest vegetation with the exception of potential fireline construction. Fire intensity and severity is intended to be low, although occasional torching and mortality is

expected. Because of the nature of prescribed fire, its effects cannot be limited to specific diameter classes or species.

Within forested stands, a direct effect would be the reduction of tree densities, primarily understory trees and scattered overstory trees. Scattered overstory mortality would create canopy openings increasing the potential for shade-intolerant species to regenerate where they exist. A reduction in understory densities should increase long-term vigor and decrease density-dependent mortality. Because prescribed fire cannot specifically remove individual trees or species of trees it is expected that a mixture of species would be present after underburn implementation. Generally speaking, since shade-tolerant conifers usually dominate the understory of forested stands, it is expected that there would be a direct reduction in shade-tolerant tree species densities. However, it is expected over time that shade-tolerant conifers would continue to regenerate in the understory. Canopy cover would be reduced associated with tree mortality and average stand diameter should increase. Prescribed fire should create a mosaic of brush patches where montane chaparral is dominant, breaking up the continuity of surface fuels and creating a new age class of brush. Overall, prescribed fire should positively affect heterogeneity within the within project area as there would be a mosaic of canopy cover and tree density due to the randomness of prescribed fire.

The hazard reduction effectiveness of prescribed burning varies by ecosystem (or fuel type) and according to the relative impacts of fuels and weather on fire behavior. Longevity of prescribed fire is conditioned by the intrinsic nature of vegetation, sooner or later, regaining its former fuel loading and structure (Fernandes and Botelho 2003).

Direct and Indirect Effects of Treatments to Improve Aspen Stands and Meadow Systems

Conifer Removal - Aspen

Aspen within the Lakes Basin Project area generally occurs at the sub-stand level within larger mixed conifer and lodgepole pine stands. It occurs on both wet and dry sites. Aspen is considered a keystone species, and aspen communities are critical for maintaining biodiversity in western landscapes (Jones et al. 2005). The limited cover of aspen forests may be misleading in terms of its role in providing critical biodiversity to the Sierra Nevada. Plant diversity is commonly higher in aspen stands than surrounding conifer vegetation types (Rogers et al. 2007). Observations in conifer-encroached aspen stands in northern California have led hypothesis that stand recruitment can be achieved by removing competing conifers from the stand (Jones et al 2005).

A direct effect of mechanical thinning would be the reduction of tree densities and canopy cover associated with conifers. A majority of conifer trees would be removed thus reducing conifer seed sources and providing an improved growing environment for aspen. Jones et al (2005) found that mechanical harvesting of conifers acted as a slight disturbance mechanism (hormonal stimulation) but predominantly created the proper growth environment (sunlight) required for

aspen regeneration and that four years after treatment there was an increase in aspen density compared to stands not treated.

A similar effect would occur where hand thinning is proposed. However, the reduction in tree densities and canopy cover would be less, depending on the amount of residual trees greater than 11.0 inches DBH. Also, there is the potential to cause mortality to aspen roots by burning slash piles and damage to overstory aspen trees from radiant heat could allow Sooty bark canker (*Encoelia pruinosa*) to become established in the existing overstory.

Both mechanical and hand thinning should improve vigor and growth of residual aspen. Over time, without hand or mechanical treatments or prescribed fire at intervals similar to historic ranges for the vegetation type, it would be expected that conifers would gradually begin to repopulate treated areas, competition for available resources would increase.

Hand Thin with Hand Pile in Meadows

Meadows are classified based on multiple environmental factors that include: hydrology, vegetation, soil characteristics, geomorphology, and altitude. Meadows fall along a hydrologic gradient of wet to dry (Gross and Coppoletta 2013). Within the Lakes Basin Project area both wet and dry meadows exist. Often, meadows occur where soils are too thin and dry to support trees or where soils are permanently saturated in poorly drained depressions (Thompson with Swanson 2007). Heavy sheep grazing, which began in the late 1800's, both impeded and encouraged tree invasion in the Sierra Nevada meadows. Heavy grazing of herbaceous meadow plants can disrupt fuel continuity and reduce fire frequency. Livestock-induced changes in stream and watershed hydrology, which have been hypothesized to include increased runoff, soil erosion, and stream entrenchment, can result in lowered water tables and improve conditions for tree seedling establishment. Comparisons of historical and contemporary photographs and descriptive letters of meadows across the Sierra Nevada provide evidence for an increase in tree cover on meadow margins over the past 100 years (Gross and Coppoletta 2013). The most effective strategy for conservation and maintenance of meadow habitats is one that targets tree removal during the early stages of encroachment. Restoration efforts should target forest-meadow edges or small tree islands to maximize the potential for dispersal of meadow species (Thompson with Swanson 2007).

The proposed action would reduce the amount encroaching conifer trees from the interior of meadows. By removing, piling, and burning activity created slash outside of meadows, the potential for converting meadow soils to a hydrophobic state would be mitigated. It would be expected that over time conifer trees may become reestablished within meadows. This reestablishment could be influenced in both a positive or negative way by future precipitation patterns, disturbances and climate.

Direct and Indirect Effects of Treatments to Improve Watershed Conditions

Road-related work, including decommissioning, obliteration, maintenance, construction and reconstruction would facilitate vegetation treatments during this project. Road construction and reconstruction would occur on a localized scale and could result in the removal of trees in all size

classes. Obliteration of roads would make these areas available for vegetation establishment, slightly affecting future structure, composition and heterogeneity at a small scale.

Cumulative Effects

The cumulative effects analysis considered past, present, and foreseeable future projects within the Lakes Basin Project area and adjacent landscape (including Yuba Ranger District on the Tahoe NF and private lands). Present and future projects on the landscape are listed in Appendix C.

Currently, the primary activities occurring within and adjacent to the project area include: timber harvesting (group selection, salvage, commercial thinning), fuelwood gathering, Christmas tree cutting, trail repair and construction, mining, grazing, and recreating. Timber harvesting is occurring on private lands outside of the project area. These treatments would improve forest health, reduce wildfire hazard on this ownership and reduce potential wildfire spread into the project area. However, due to the small scale of area treated, the cumulative effects would be minimal.

There are no foreseeable future vegetation management projects within the Lakes Basin Project area. Reoccurring activities include fuelwood cutting, Christmas trees gathering, mining, grazing, and activities associated with recreation. These activities would have negligible cumulative effects. However, within close proximity to the project area, foreseeable future projects include the Plumas Eureka and Haskell projects on the Beckwourth Ranger District of the Plumas National Forest and the Yuba project located on the Yuba Ranger District of the Tahoe National Forest. The Plumas Eureka and Haskell projects would occur in similar vegetation types with comparable structure as the Lakes Basin Project. These projects would entail activities similar to the Proposed Action. The effects to forest densities, species composition, stand structure, wildfire hazard, and heterogeneity would parallel those of the Proposed Action.

The treatment activities proposed now and similar foreseeable future vegetation management activities potentially have the cumulative effect of improving forest health and resiliency, reducing fuel loading, and improving aspen stands and meadow systems across the landscape. Insects and pathogens would continue to exist but the risk of elevated population levels or occurrence would be reduced. Mortality due to endemic insect and disease levels would continue to recruit snags which would eventually transition to down woody material. Stand structure would become more heterogeneous and diversified as small trees are removed, canopy openings are created and dense clumps are retained. The removal of encroaching conifers in aspen stands and meadows would have a positive cumulative effect on maintaining these habitats on the landscape. Diameter distribution would trend towards a more balanced allocation. Shade-intolerant tree species would be promoted and shade-tolerant trees species preferred for removal, thus improving species composition. Wildfire hazard would be reduced by decreasing canopy continuity and increasing canopy base heights. Landscape heterogeneity would be improved by creating canopy openings, retaining dense clumps of trees and variable tree retention levels within the matrix. The use of topography and microsites would further diversify forest structure.

The Proposed Action would increase heterogeneity at the stand level, cumulatively within the project area and on the landscape. The greater cumulative effect would be within the project area and less so at a larger scale. However, the Proposed Action combined with future foreseeable projects would move the landscape towards one of improved forest health and resiliency and reduced fuel loading.

Alternative 2 – Spotted Owl Habitat Management Alternative

Direct and Indirect Effects of Treatments to Improve Forest Health

Mechanical Thinning and Hand Thinning

Approximately 351 acres in Spotted Owl Home Range Core Area (HRCA) that would be mechanically thinned under Alternative 1 would be hand thinned under Alternative 2. Also, an additional 117 acres that are proposed for mechanical or hand thinning under Alternative 1 would receive no treatment under Alternative 2. Therefore, a total of approximately 469 acres in both WUI defense zones and general forest under Alternative 2 would no longer be prescribed mechanical thinning. This change from mechanical thinning to hand thinning and no treatment would result in fewer acres meeting the desired conditions associated with forest health and resiliency. Stand densities, stand structure, species composition, and wildfire hazard issues would not be addressed on these acres.

Table 11 displays attributes of stands where prescribed treatments shifted from mechanical thinning to hand thinning. Since hand thinning only removes trees less than 11.0 inches DBH, overall TPA would be reduced. However, residual basal area and relative SDI would remain above the desired conditions described in the “Existing Conditions” section of the Lakes Basin Project Vegetation Report (USDA 2018a). Also, crown base height (CBH) and the potential for torching would be reduced but canopy densities and potential mortality associated with wildfire (under severe conditions) would remain high.

Areas that change from mechanical thinning to hand thinning would be left at higher risk to density-related mortality, insects and disease and high levels of mortality associated with potential wildfire. Species composition would be slightly affected but conditions conducive (i.e. canopy openings) to promoting shade-intolerant conifers would not be created. Stands would maintain a homogeneous condition over time and would not meet the purpose and need of the project.

Direct and Indirect Effects of Treatments to Improve Aspen Stands and Meadow Systems

There is no change in direct and indirect effects between the Proposed Action and Alternative 2.

Direct and Indirect Effects of Treatments to Improve Watershed Conditions

Road-related work, including decommissioning, obliteration, maintenance, construction and reconstruction would facilitate vegetation treatments during this project. Road construction and reconstruction would occur on a localized scale and could result in the removal of trees in all size

classes. Obliteration of roads would make these areas available for vegetation establishment, slightly affecting future structure, composition and heterogeneity at a small scale.

Cumulative Effects

Alternative 2 was developed to comply with the Draft Interim Recommendations for the Management of California Spotted Owl (CSO) Habitat on National Forest System Lands. It does so by shifting mechanical thinning treatments to hand thinning type treatments or no treatment within designated habitat acres for the CSO. Under Alternative 2, there would be a decrease in the number of acres within the project area shifting towards desired conditions of stand densities, stand structure, species composition and wildfire hazard in both WUI defense zones and general forest.

Like the Proposed Action, the cumulative effects of Alternative 2 also occur in the context of past, present, and foreseeable future actions. Past projects and events are reflected in the vegetation layer used to characterize the existing conditions (the baselines for analysis) in the analysis area. The same present and foreseeable future projects utilized for the Proposed Action apply to Alternative 2.

Overall, project area forest health and resistance and resilience to disturbance would be improved when compared to the No-action Alternative. However, since hand thinning removes only small trees, there would be a less beneficial cumulative effect at both the project level and landscape level when compared to the Proposed Action. Fewer acres would incur improved heterogeneity within the project area and landscape. Over time, the project area would continue to maintain a higher level of homogeneity compared to the Proposed Action. The Proposed Action would better meet the Purpose and Need of the Lakes Basin Project than Alternative 2.

Alternative 3 – No-Action Alternative

Direct and Indirect Effects of No Action

Under Alternative 3, none of the proposed activities in Alternatives 1 or 2 would occur. However, this does not imply that the current condition would remain constant. Since forest ecosystems are not static, they would continue to change as a result of naturally occurring dynamic forces such as forest succession and wildfires. The current conditions as described under “Existing Conditions” would persist; the gaps between the current conditions and desired conditions would not be addressed. Current, on-going activities such as routine road maintenance, fire suppression and recreation would continue to occur within the project area. Overall, forested stands would continue to get denser, more homogenized, remain at elevated risk to insects and disease and not meet the desired conditions identified for the Lakes Basin Project.

Effects on Stand Density

Trees per acre is expected to remain high in both mixed conifer stands (Table 41) and lodgepole pine stands (Table 42) and weighted towards smaller DBH ranges. Currently there are

approximately 314 TPA less than 3.0 inches DBH in mixed conifer stands and 136 TPA in lodgepole pine stands. Regeneration would be variable and continue over time, dominated by shade-tolerant conifers. Shade-intolerant conifers would continue to struggle to become established under the high shade environment. Already lacking on the landscape, the number of medium and large trees (trees greater than 24.0 inches DBH) would slightly increase, but stands would still be vastly dominated by smaller trees. These smaller trees present a fire hazard as ladder fuels to larger trees and elevate the risk of stand-replacing wildfire. Diameter distribution in mixed conifer stands would not move closer to a more balanced structure.

Table 41. Modeled effect of No Action on Trees Per Acre (TPA) by diameter class over time in mixed conifer stands in the Lakes Basin Project Area.

Year	3”-9.9”	10”-17.9”	18.0” -23.9	24”-29.9”	30”+
0	162	73	23	9	5
10	199	66	25	12	7
20	197	57	24	13	10

Table 42. Modeled effect of No Action on Trees Per Acre (TPA) by diameter class over time in lodgepole stands in the Lakes Basin Project Area.

Year	3”-9.9”	10”-17.9”	18.0” -23.9	24”-29.9”	30”+
0	88	64	25	5	4
10	92	57	26	7	5
20	124	50	30	10	5

Under the No-action Alternative, basal area within mixed conifer stands is expected to stay above the desired range of 150 to 200 square feet of basal area per acre (Table 43). Stands would continue to have severe levels of inter-tree competition for water, nutrients, available sunlight and growing space, maintaining an elevated risk to insect attack. There would be a continued lack of understory forage production. Conversely, post-treatment basal area in mechanically thinned units under Alternative 1 would be within the desired range (Table 26) and generally meet project purpose and need associated with forest health.

The current relative SDI for mixed conifer stands in the project area ranges from 29 to 97 percent with an average of 66 percent, based on a maximum SDI of 550. The average relative SDI associated with mechanical thin units is approximately 75 percent (Table 27). Without any vegetation management proposed under Alternative 3, existing average relative SDI would remain above the desired conditions (USDA 2004c). This would leave a majority of stands at elevated risk to insects and disease. Also, stands would remain above the lower threshold associated with the onset of density-related mortality as severe levels of competition for limited resources continues. Relative SDI is predicted to persist at high levels (Table 44) and density related forest health issues would continue in the long term without thinning. This is quite

different than what previous studies have indicated historically in similar forests (Table 13). These studies show that relative SDI was as low as 18 percent and as high as 53 percent, which is lower than the current relative SDI in the Lakes Basin Project area. Comparatively, the projected post-treatment relative SDI of the Proposed Action ranges from 28 to 46 percent (Table 27). Mechanical treatments under Alternative 1 would best meet project objectives of maintaining appropriate stand densities associated with forest health. Alternate 3 would not meet the purpose and need as discussed in Chapter 1.

Table 43. Modeled effect of No Action on Basal Area over time in mixed conifer stands in the Lakes Basin Project Area.

Year	Current Average Basal Area (ft^2/acre)	Percent Above Desired Range (150-200ft^2/Acre)
0	237	118%
10	259	130%
20	269	135%

Currently, average SDI associated with lodgepole pine stands is approximately 268 with a range of 167 to 372 and are susceptible to mountain pine beetle attacks. Stand density index would continue to increase over time (Table 45) as would susceptibility to mountain pine beetle attacks. Small trees would continue to compete for limited resources in addition to maintaining a higher fire hazard. The Proposed Action would only reduce SDI to approximately 254 since only small trees associated with hand thinning would be removed. However, stand densities of small trees would be reduced, increasing the availability of resources and decreasing the amount of ladder fuels. Therefore, treatments in Alternative 1 would better meet the project objectives when compared with the No-action Alternative.

Table 44. Modeled effect of No Action on relative Stand Density Index (SDI) in mixed conifer stands over time in the Lakes Basin Project Area.

Year	Average Relative SDI	Desired Relative SDI
0	66%	35%-60%
10	70%	35%-60%
20	70%	35%-60%

Table 45. Modeled effect of No Action on relative Stand Density Index (SDI) in lodgepole stands over time in the Lakes Basin Project Area.

Year	Average SDI	Desired SDI
0	268	170
10	316	170
20	338	170

Effect on Species Composition

Currently, shade-tolerant conifers (white fir, incense cedar, Douglas-fir) make up approximately 91 percent of the stand species composition based on TPA and 75 percent of the current BA (Figure 6 and Figure 7). Under the No-Action Alternative, shade-tolerant conifers would continue to dominate mixed conifer stands in the project area. The ratio of shade-tolerant to shade-intolerant conifers is not expected to change over time (Table 46). High stand densities have created an environment conducive to perpetuating shade-tolerant conifers and would continue to do so over time. Since white fir has a low tolerance to drought and Douglas-fir a moderate tolerance to drought, these species could experience greater mortality with predicted climate change. Under the No-Action Alternative all species are expected to incur mortality due to high stand densities (Table 47). However, this predicted mortality may not be enough to shift stand composition back towards shade-intolerant species. Both Action Alternatives 1 and 2 propose treatments which preferentially remove shade-tolerant conifers. Also, both action alternatives would create canopy gaps, allowing shade-intolerant conifers to become established, thus gradually improving the species composition. Therefore, the action alternatives can shift stand species composition towards a desired stand composition with fewer shade-tolerant and fire-intolerant conifers, better meeting project objectives. Alternative 3 would not meet the purpose and need.

Table 46. Effect of No Action on distribution of shade-tolerant and shade-intolerant species Basal Area (BA) over time in the Lakes Basin Project Area.

Year	Shade-tolerant (BA)	Shade-intolerant (BA)	Total Basal Area (BA)
0	75% (178)	25% (60)	238 ft^2/ac
10	75% (195)	25% (64)	259 ft^2/ac
20	75% (204)	25% (65)	269 ft^2/ac

Table 47. Effect of No Action on average Trees per Acre (TPA) over time in the Lakes Basin Project Area.

Year	Trees Per Acre for Major Tree Species* (0.0" and Greater)									
	WF	IC	DF	RF	PP	JP	SP	WWP	LP	AS
0	179	207	132	14	22	12	7	<1	12	<1
10	139	158	96	12	17	10	6	<1	10	<1
20	107	120	72	10	13	9	5	<1	7	<1

*WF=white fir; IC=incense cedar; DF=Douglas-fir; RF=red fir; PP=ponderosa pine; JP=Jeffrey pine; SP=sugar pine; WWP=western white pine; LP=lodgepole pine; AS=aspen

Effect on Wildfire Hazard

Surface, ladder and canopy fuels would remain untreated under the No-Action Alternative. Based on modeling, wildfire hazard indices may decrease within mixed conifer stands over time (Table 48). The increase in CBH could be attributed to gradual growth of small trees and density-related mortality due to high stand densities. There would be a slight decrease in predicted BA mortality within 10 years and increased change within 20 years. It would be expected that there

would be mortality of trees in the overstory due to high levels of competition contributing to the decrease of BA mortality. However, stand density related mortality would contribute to surface fuel loading over time, increasing surface fire intensity and increasing the potential of a surface fire transitioning to the canopy. When compared to the Proposed Action, the No-Action Alternative does not meet the project objectives regarding fuels reduction. This is especially true around the community of Graeagle, where WUI defense zone treatments are primarily situated. Table 30 and Table 31 display the effects of the Proposed Action in regards to potential wildfire hazard within proposed mechanical thin areas. The No-Action Alternative would not improve resistance or resiliency to potential wildfire or firefighter and public safety, which could lead to potential future injuries or fatalities during wildfire events.

Table 48. Effect of No Action on Wildfire Hazard Indices over time in the Lakes Basin Project Area.

Year	Crowning Index (mph)	Flame Length (Feet)	Probability of Torching (P-Torch) (%)	Canopy Base Height (Feet)	Canopy Density (kg/m^2)	Basal Area Mortality (%)
Year 0	21	43	43	5	0.128	81
Year 10	21	47	46	7	0.122	78
Year 20	22	38	39	11	0.111	57

Effect on Species Heterogeneity

The majority of the forested acres (81%) within the Lakes Basin Project area are classified as CWHR size class 4 (Table 15). The dominant canopy condition is closed (CWHR density classes M and D) as displayed in Table 16. Under the No-Action Alternative, stands would maintain a homogeneous state, with a diameter distribution reflective of a reverse-J curve, a high level of small trees and a lack of large trees. The desired condition is to increase heterogeneity at the stand level and the project level. Although over time density related mortality would occur, there would be a continued high level presence of shade-tolerant conifers in all size classes. With high stand densities, insect populations could become epidemic, creating early seral conditions at a scale outside of the desired conditions. Also, potential stand-replacing wildfire could create early seral conditions at undesirable levels. However, treatments proposed in the action alternatives would increase heterogeneity through the implementation of variable density thinning across the project area by creating canopy openings, retaining dense clumps of trees and variable retention of tree densities within the matrix.

At current densities, stands would generally remain in CWHR size class 4 for the foreseeable future. The average quadratic mean diameter (QMD) and range of QMDs would increase over time. Canopy cover averages would fluctuate and in the case of general forest stands, would actually begin to decrease after 20 years. This could be attributed to density-related mortality occurring in the overstory. The Proposed Action would immediately increase the average QMD

due to the reduction of small trees. Over time stands would begin to shift sooner into CWHR size class 5 when compared to the No-Action Alternative (Table 49 and Table 50). Without treatment, the project area would maintain a homogeneous condition composed of stands of similar structure and composition which is less resilient and more susceptible to insect and pathogen outbreaks, competition-related mortality, wildfire, and drought (North et al. 2009; North 2012; Stephens et al. 2010; Millar et al. 2007).

Table 49. Comparison of the effects of Alternative 1 and Alternative 3 on canopy cover and quadratic mean diameter (QMD) in the WUI Defense Zone for the Lakes Basin Project Area.

Year	Alternative 1 – Proposed Action		Alternative 3 - No-Action Alternative	
	Canopy Cover (Range)	QMD (Range)	Canopy Cover (Range)	QMD (Range)
0 – (Immediate Post-treatment)	31% (29%-36%)	21.7” (19.2” – 25.4”)	61% (47%-68%)	14.8” (13.6”-17.0”)
10	33% (31%-37%)	24.1” (22.0”-24.5”)	62% (52%-69%)	16.3” (15.7”-18.6”)
20	37% (37%-48%)	24.9” (21.3”-29.4”)	61% (55%-70%)	17.8” (16.5”-20.2”)

Table 50. Comparison of the effects of Alternative 1 and Alternative 3 on canopy cover and quadratic mean diameter (QMD) in General Forest for the Lakes Basin Project Area.

Year	Alternative 1 – Proposed Action		Alternative 3 - No-Action Alternative	
	Canopy Cover (Range)	QMD (Range)	Canopy Cover (Range)	QMD (Range)
0 – (Immediate Post-treatment)	42% (40%-46%)	20.1” (17.0”-23.6”)	58% (45%-72%)	14.9” (13.3”-17.0”)
10	44% (40%-49%)	22.2” (19.5”-25.6”)	58% (44%-70%)	16.4” (14.9”-18.4”)
20	46% (41%-52%)	24.9” (21.3”-29.4”)	56% (42%- 68%)	18.2” (16.5”-20.9”)

Cumulative Effects of No Action

Like the Proposed Action, the cumulative effects of the No-action Alternative also occur in the context of past, present, and foreseeable future actions. Past projects and events are reflected in the vegetation layer used to characterize the existing conditions (the baselines for analysis) in the analysis area. The same present and foreseeable future projects utilized for Alternatives 1 and 2 apply to the No-action Alternative.

No treatments would be implemented and existing forest health issues related to stand density, stand structure, and species composition across the project area would continue. Stand densities would remain high, especially in small diameter trees, and susceptibility to insects, disease, high severity wildfire, and drought would increase over time. Stand structure would favor the regeneration and growth of shade-tolerant conifers, resulting in a continued dominance of those species and a reduction of existing shade-intolerant conifers. Seral stage diversity would continue to remain dominated by mid-seral closed-canopy stands. Also, conifer encroachment would continue in aspen stands and meadows, gradually replacing those unique habitats.

Under Alternative 3, density-dependent mortality, wildfire, and wildfire suppression would be the primary modifiers of forests within the project area. The creation of early seral conditions would rely upon disturbances. Although small-scale disturbances such as endemic insect and disease outbreaks, windthrow, low-severity fires, and minor mortality would decrease stand densities, it would most likely not be enough to significantly change structure, improve resistance and resilience. The potential for large-scale disturbances, such as epidemic population levels of insects and high-severity wildfires in addition to the effects of drought, currently exists and would continue with no active management. Large-scale disturbances could significantly alter stand and landscape structure to levels far exceeding management intent or objectives. For example, widespread mortality from bark beetles or high-severity wildfire could create a landscape of early seral conditions void of heterogeneity. An event of this magnitude could negatively impact the experience of recreationalist and thus negatively impact the economic livelihood of surrounding communities.

Overall, the No-Action Alternative would not shift the project area towards desired conditions and fewer acres across the landscape would experience improved forest health and resiliency and fuels reduction.

Summary of Environmental Consequences for Silviculture

Alternative 1 (Proposed Action) and Alternative 2 (CSO Alternative)

The best opportunity to mitigate bark beetle-related damage is through preventative measures. Prevention activities associated with pine bark beetles include managing the vegetation to promote healthy stands and implementing measures to reduce diseases. Preventative measures related to the fir engraver include maintaining proper stocking, favoring pine on pine sites, and implementing measures to reduce or prevent diseases (USDA 1988b). The Proposed Action (Alternative 1), and to a lesser degree Alternative 2, would decrease stand densities thus improving tree vigor, decrease the amount of shade-tolerant trees, promote shade-intolerant pines and increase structural heterogeneity (characterized by canopy openings, dense clumps and matrix). Battles and others suggest that forest management strategies that increase species diversity, promote heterogeneity and create lower density stands would be effective in providing “structures that are more resilient to catastrophic events like fire and epidemics”. Also, reductions in stand density are the most effective treatment for reducing bark beetle-caused tree mortality (Battles et al. 2008). Reducing competition improves tree growth and defensive mechanisms while often disrupting pheromone plumes, thus negatively affecting the beetle’s ability to locate and successfully mass attack host trees. Additionally, increases in stand- and landscape-level heterogeneity may reduce the occurrence of high levels of bark beetle-caused tree mortality while maintaining endemic (low) levels (North 2012).

Alternative 3 – No Action Alternative

No treatments would be implemented under Alternative 3. There would be a continued lack of heterogeneity, stand densities would not be reduced and no improvement to species diversity, thus not providing for structures that are more resilient to catastrophic events like fire and insect

and disease epidemics. The potential for insect populations to remain above normal levels, spread, and cause significant loss of recreation values and negatively affect adjacent resources would remain. Forested landscapes that contain little heterogeneity promote the creation of large contiguous areas susceptible to bark beetle outbreaks (North 2012).

Climate Change

Environmental Consequences

Alternatives 1 and 2 – Proposed Action and California Spotted Owl Habitat Alternative

Direct and Indirect Effects of All Treatments Proposed in Action Alternatives

Several studies have examined the trade-offs of treatments in terms of treatment emissions, carbon storage and creating forest structure that is resistant to high severity disturbances (Stephens et al. 2009, Hurteau and North 2009). Both Hurteau and North (2009) and Stephens et al. (2009) found that while untreated forests stored more carbon, these dense, homogeneous forests were more at risk for high-severity fire. Both studies suggest that low density stands dominated by large fire-resistant pines created by fuel treatments best protect carbon stocks in forests that have an active fire disturbance regime.

Battles et al. (2008) evaluated the impacts of climate change on the mixed-conifer region in California and provided insight to forest health concerns and management implications for forest managers. This study found that changes in climate could “exacerbate forest health concerns” by increasing weakened tree susceptibility to mortality as a result of fire, disease epidemics and insect outbreaks and potentially enabling forest insects and disease to expand ranges or increase potential for widespread damage. Weak trees are less able to resist pathogen infections and insect attacks.

Battles et al (2008) suggests that forest management strategies that increase species diversity, promote heterogeneity and create lower density stands would be effective in providing “structures that are more resilient to catastrophic events like fire and epidemics”. McDowell et al. showed (2003) that reductions in stand density have a favorable growth effect on old-growth ponderosa pine which may reduce their susceptibility to drought induced mortality. The Proposed Action (Alternative 1), and to a lesser degree Alternative 2, would decrease stand densities thus improving tree vigor, decrease the amount of shade-tolerant trees, promote shade-intolerant pines, and increase structural heterogeneity (characterized by canopy openings, dense clumps and matrix). The creation of canopy openings would encourage the establishment of a new age class of shade-intolerant pines. These younger trees have higher rates of carbon sequestration but lower levels of total amount of carbon stored (Malmsheimer et al. 2008). Thinning within the matrix would result in increased growth rates and increased leaf area and therefore should increase the capacity for carbon uptake and storage. Also, wood products such as home construction lumber would be generated contributing to continued sequestration of carbon. Larger, down woody debris would be retained at varying levels, maintaining nutrient

cycling. Over time, there would be continued tree regeneration and carbon sequestration. Tree regeneration would be dependent on future precipitation patterns and potential disturbances

The proposed treatments are the first step in the restoration process and provide a reduction of stand densities, create change in species composition and enhance growth. Although both The Proposed Action and Alternative 2 improve forest health and resilience and increase resistance, Alternative 2 does less so because it treats fewer acres mechanically (Table 2). Because of the inherent limitations of hand thinning, residual stand densities (SDI, BA/A, TPA) are higher than desired conditions under Alternative 2. The Proposed Action would have greater benefit with regards to climate change.

Cumulative Effects of All Treatments Proposed in Action Alternatives

The cumulative effects analysis considered past, present, and foreseeable future projects within the Lakes Basin Project area and adjacent landscape (including Yuba Ranger District on the Tahoe National Forest and private lands). Present and future projects on the landscape are listed in Appendix C.

Past management, including historic era logging and wildfire suppression, have largely influenced the forest vegetation that is present today. Past projects and events are reflected in the vegetation layer used to characterize the existing conditions (the baselines for analysis) in the analysis area. Past activities on both private and National Forest System lands ranged from selective cutting to even-age silvicultural systems. When coupled with fire suppression, this has resulted in conversion of a heterogeneous mid to later seral forest to a more homogenized mid seral landscape dominated by more shade-tolerant conifers. Where even-age regeneration methods were implemented, stands are generally dominated by young trees and varying levels of brush. These younger trees have higher rates of carbon sequestration.

The Lakes Basin Project is proposed on a local scale and is not intended to have cumulative effects that are measureable on a global scale in regards to climate change. However, the Lakes Basin Project has a small scale effect on mitigating climate change when combined with other management actions regionally.

Alternative 3 – No-Action Alternative

Direct and Indirect Effects of No Action

No treatments would be implemented under the No-Action Alternative. There would be no improvement in the ability of trees to resist insect attacks or pathogen infections. Resilience to disturbances (e.g. wildfire) would not be enhanced. Unmanaged forests can store more carbon over their lifespan above and below ground per unit area, but as they become mature, carbon accumulation reaches a steady state. Also, there is a high probability that in time, unmanaged, dense forests face a higher risk of stand-replacing fires or insect infestations (Malmsheimer et al 2008). Under the No-Action Alternative, the forested landscape within the Lakes Basin Project area could experience major modifications due to climate change over time. If a major disturbance were to occur, such as a bark beetle population explosion or large scale wildfire, and

substantial tree mortality occurred, the analysis area would become a source of carbon emissions rather than a carbon sink.

Cumulative Effects of No Action

The Lakes Basin Project is proposed on a local scale and is not intended to have cumulative effects that are measureable on a global scale in regards to climate change. However, the No-Action Alternative under the Lakes Basin Project would not contribute to mitigating climate change when combined with other management actions regionally.

Fire and Fuels

Existing conditions

This project and the analysis area are located in the upper-montane forest zone. Currently, the dominant vegetation type is mixed conifer characterized by the presence of white fir, Douglas-fir, incense cedar, ponderosa pine, Jeffrey pine, and sugar pine. Conifer species in the upper-montane zone vary in their ability to survive fire. Red and white firs have thin bark when they are young, but their bark becomes thicker as they age allowing them to survive low-intensity fires. Within the analysis area, Jeffery pine is most adapted to frequent fire cycles followed by sugar pine, and white pine. Fire tolerant species are found in low numbers scattered throughout the project area and are an indicator that fire played a greater role in past forest structure and function. Pine species are often found as scattered individuals or small groups of trees that are unable to reproduce due to a thick understory of fir. These shade-intolerant trees were probably much more prevalent and abundant under past fire regimes particularly on south and southwest facing slopes.

Pre Historic Fire History by Dominant Vegetation Types

This following section provides a brief description of the past and recent fire history, and surface fuels, as they relate to the Lakes Basin Project. Fire has been one of the most ecologically important processes in the development of terrestrial ecosystems throughout the northern Sierra Nevada mountain complex (Skinner and Chang, 1996). Fires direct role or regime in an ecosystem is described in terms of frequency, rotation, spatial extent, magnitude, and seasonality. The spatial patterns and temporal bounds of fire regimes across the landscape are highly variable and are influenced by, but not limited to, climatic oscillations, topography, and existing vegetative composition and structure (Moody et al. 2006; Agee 1993, Fites-Kaufman 1997, Beaty and Taylor 2001, Skinner and Chang 1996). Proposed vegetation and road treatments would occur primarily within the following vegetation types: Sierra mixed conifer and lodgepole pine forests.

Sierra Mixed Conifer

Prior to the twentieth century, the mean fire return interval for the Sierra mixed conifer forest type has been reported as 7 years (range is 1 to 53 years) for the “East Quincy” study plot near the project area (Moody et al. 2006). Other studies have reported fire return intervals in mixed conifer forests in the Sierras as 11.5 years (the range is 1 to 25 years for south-facing slopes)

(Beaty and Taylor 2001) and 4.7 years (the range is 4 to 28 years) (Stephens and Collins 2004). From these studies it can be inferred that low- to moderate-severity fires, whether human or lightning caused, were a common occurrence in the analysis area into the early 20th century.

Lodgepole Pine

Successful fire exclusion in the 20th century has created not only a severe fire problem across the West, but has aided in changing species composition over much of the landscape. Dense thickets of lodgepole pine have developed in many sites apparently due to a decreased fire frequency. Lodgepole pine encompasses approximately three percent (367 acres) of the project area. Typically the lodgepole pine zone is found above red fir and below other subalpine habitats. Lodgepole pine most closely associates with the red fir habitat of lower elevations. Many Sierran meadows have been invaded over the last few centuries by lodgepole pine (Bartolome 1988). In the upper montane forests of the Sierra Nevada and Cascades lodgepole pine is a tree of moist places-creek banks and meadow margins-where it consorts with red and white firs, Jeffrey pine, and quaking aspen (Lanner 1999). Lodgepole pine is a prolific seed producer. Cones bearing viable seed are produced at an extremely early age, 5 to 20 years old (Burns and Honkala 1990) (USDA 2018a).

Recent Fire History

Historic fires in the Lakes Basin Project area have been recorded since approximately the 1920's. Table 51 shows the Lakes Basin Project fire history by designated fire size class, actual fire size and number of fires recorded for that given size class. A total of 2 fires have been recorded within the project area. Sources of human ignition exist in the area, these include: highly traveled forest roads and dispersed recreation. Fire activity peaks in July through September, with the large fires historically driven northeast from a general southwest wind.

Table 51. Recorded Fire History within the Lakes Basin Project Area since 1920 based on Plumas National Forest spatial data (GIS).

Fire Class	Fire Size	Number of Recorded Fires
A	Spot to 0.25 acres	None Recorded
B	0.26-9.9 acres	None Recorded
C	10.0-99.9 acres	None Recorded
D	100.0-299.9 acres	None Recorded
E	300.0-999.9 acres	1 fire 617 acres
F	1,000.0-4,999.9 acres	1 fire 2,949 acres
G	5000.0 acres plus	None Recorded

Environmental Consequences

Alternative 1 – Proposed Action

Direct and Indirect Effects of Treatments to Improve Forest Health

Measurement Indicator: Effective Fuels Reduction

Alternative 1 implements fuel reduction treatments reducing surface, ladder and canopy fuels through the use of mechanical thinning, hand thinning and pile burning, grapple piling and pile burning, and underburning. The Alternative 1 tactic of "variable density thinning" would incorporate canopy openings, dense clumps, and varying tree retention levels, silvicultural techniques that are designed to achieve effective fuel reduction and incorporate ecologically important stand and landscape level spatial heterogeneity common in frequent fire adapted forests in the project area (North et al. 2009). Thinning would focus on smaller size classes of trees for removal, except where some retention is prescribed of smaller diameter trees that do not fall into a fuel ladder condition to achieve a more even diameter distribution. The thinning would preferentially select shade-tolerant, non-fire resilient trees in the mid to upper canopy strata (intermediate and co-dominant crown classes with scattered dominants) to reach the silvicultural prescription average basal area stocking level and spatially explicit "clumps and openings" type of arrangement. Mechanical thinning would remove conifers <30 inches DBH with a species preference guideline favoring shade-intolerant conifers which would enhance the species composition within the project area.

Predicted fire behavior and model outputs from Forest Vegetation Simulator-Fire and Fuels Extension (FVS-FFE) showed similar trends across all dominant vegetation types (See Lakes Basin Project Forest Vegetation Report, USDA 2018a). The "variable density thin" treatment targeting the majority of the suppressed and intermediate fire-intolerant tree species and augmented thinning around fire-resilient legacy trees (i.e. Jeffery pine, ponderosa pine, sugar pine and Douglas-fir) in the stand significantly increases vertical separation and average stand canopy base height from 5-8 feet pre-treatment to 44-51 feet post-treatment. The prescribed retention of isolated small diameter trees could be susceptible to scorch related mortality under 90th percentile weather conditions (Stephens and Moghaddas 2005) even so the overall predicted mortality is considerably decreased following treatments. Damage can be minimized through the use of favorable prescribed fire burning conditions and/or mechanical fuel reduction methods. The proposed treatments show a decrease in the percent of potential mortality from fire related damage that can be expected in the treatment units from a percent probability of 75%-89% mortality to 6%-18% mortality. Horizontal canopy fuel continuity and crown fire spread potential is further decreased due to a clumped tree distribution, where groups of trees are separated by gaps (North et al. 2009).

Alternative 1 would reduce the surface, ladder, and canopy fuels which in turn would increase canopy base height and reduce flame length, resistance to control and the potential for a fire to transition into crown fires. Decreasing crown density may lead to increased surface winds (less canopy to reduce winds before they reach the ground) and surface fuels may be drier (more

sunlight reaching the ground) but not noticeably more than under current fuel conditions (Agee and Skinner 2005). It is estimated that Alternative 1 would open canopies to the extent needed to realize these concerns. It is estimated that in most areas, canopy cover would remain greater than or equal to 40% in all fuel types and down to approximately 30% in the WUI, even after treatment. This change would be sufficient to change the amount of wind reaching the surface. If full fire suppression continues as the management strategy for unplanned ignitions within the project area, fire suppression resources would have an improved ability to control fires during initial attack with minimized risk to their safety (and the public) and increased ability to keep fires small in size with the use of direct attack tactics versus indirect tactics. Fires entering the treated stands would typically drop from the crowns to the forest floor, notably changing fire behavior. Aerial firefighting resources would be better able to penetrate the canopy to aid ground resources due to reduced canopy density (Moghaddas and Craggs 2007).

Refer to Table 30 and Table 31 for effects of mechanical thinning on wildfire behavior measurement indicators in the WUI defense zone and in general forest respectively.

Design features used to minimize fire effects and/or retain habitat structures preferred by wildlife species, such as grouping of larger trees and structural diversity patches, will have lower potential for loss since they would not be continuous and would allow for more effective fire suppression. This would be similar to the variability in forest conditions produced by frequent fire (North et al. 2009).

In utilizing mechanical treatments, stand structures are modified quickly and more precisely than with prescribed fire alone (North et al. 2009). Under this alternative, treatments would be effective in breaking up the horizontal and vertical continuity of live fuels in the lower canopy layers and/or, in effect pre-treating the stands to more readily allow prescribed fire to be re-introduced. Silvicultural treatments can only partially substitute for fire (Weatherspoon, 1996). This alternative allows increased potential to utilize prescribed fire as either a maintenance treatment and/or in conjunction with mechanical treatments as a follow-up process to achieve forest resilience. Prescribed fire could mimic the natural ecosystem functions of frequent low-to-moderate-severity fire (Weatherspoon, 1996).

Underburning is the only proposed treatment method for a large portion of the Lakes Basin Project (approximately 2,404 acres). This is due to limited access for equipment, primarily on steeper slopes. Although these areas have mixed high and low tree density as well as a brush component, they are not available for mechanical harvest. These areas can safely be underburned under optimal weather and fuel conditions to reduce surface fuels to meet desired condition. A large portion of the Lakes Basin Project area has not seen fire in recorded history, and by underburning areas that are not accessible by other methods we can preserve this landscape for future generations to enjoy. Lastly, underburning would be used as a follow-up surface fuel post-treatment especially in the WUI. The actual surface fuel treatment across all units would depend on post-mechanical fuel treatment evaluations of surface fuels in fuel treatment units. For example, after mechanical treatment, areas not meeting desired conditions with respect to surface fuels may be further treated with prescribed fire. Follow up surface fuels

treatments would substantially diminish existing and activity-generated surface fuels and potential fire behavior compared to current conditions.

All units proposed for underburning will have a burn plan completed, with established and generally excepted fire weather prescriptions to meet the identified objectives for the burn unit. Units meeting desired conditions would not be burned, thereby decreasing total burned acres and emissions. Due to operational constraints underburning and pile burning would be conducted over a 5- to 10-year period. During this lag time of treatment, surface fuels could increase to higher than pre-treatment levels, however this potential increase is not expected to increase fire behavior and risk beyond what would occur under current conditions. The project proposes the use of whole tree harvesting which does not add significant amounts of activity generated fuels and minimizes additional fuel accumulations in the treatment areas. This modification to the surface fuel loading was accounted for in the fuel model selection assigned to the pre-treatment, post-treatment, and 10 year post-treatment environments. The reductions in surface fuels may be achieved through a variety of treatments including grapple piling, hand piling, underburning and pile burning. It is estimated that surface fuel loading would directly influence the potential flame lengths and fireline intensity in the post-treatment environment by more than half allowing for increased probability of suppressing a wildfire during the initial attack phase.

Effects of Grapple Pile and Hand Thinning

In areas where there are lower amounts of ladder fuels or in areas where mechanical thinning is not feasible, grapple piling, and hand thinning would be used to open or separate the lower canopy from the mid to upper level canopy. In instances where there is a lot of down wood or a large brush component, grapple pile will be used to change the vertical continuity of the fuel by grapple piling the material into piles. Grapple piling of shrubs is more effective than mastication as it pulls the shrubs up by the roots, decreasing the amount of shrub regeneration in an area. Once the piles have been burned, surface fuels are removed, thus lowering fire effects and decreasing the time it takes fire personnel to suppress and control fire in the treatment area.

Where small diameter trees are the dominant vegetation cover, hand thinning can be used to change the vertical and horizontal continuity of the fuel. Hand thinning takes the small diameter trees(<11 inches DBH) and piles them on site for later burning thus lowering fire effects and decreasing the time it takes fire personnel to suppress and control fire in the treatment area. Hand thinning would be used where feasible, especially on slopes where equipment is not allowed to operate, or other resource concerns preclude the use of mechanized equipment, to effectively reduce surface and ladder fuels.

Effects of Treatments on Firefighting Operations and Public Safety

The proposed modifications under this alternative to the surface, ladder and canopy fuel portions of the Lakes Basin Project fuel profile would enhance the ability of firefighting personnel to safely manage and engage in suppression actions in the event of a wildfire. Due to the strategic placement of the treatment units and National Forest System roads, conditions would allow for safe ingress and egress for fire personnel, equipment and public land users

should a wildfire impact these areas. Greater amounts of aerial retardant would penetrate the dominant overstory canopy and reach the surface fuels slowing the forward combustion of fuels in the treatment areas. The proposed mechanical thinning, hand thinning, and grapple piling units would result in a marked improvement to potential fire behavior and effects related to firefighting operations and public safety.

Cumulative Effects

The activities listed in Appendix C, that can be expected to be implemented include active range allotments, fuel wood and Christmas tree gathering and recreational use. Recreational activities near the project area include the Lakes Basin Recreation Area and dispersed camping, hunting, fishing, hiking, mining and OHV use. All of these activities are likely to contribute to possible future ignition sources in the project area. The trend of increased human ignitions is predicted to increase in the Lakes Basin Project area (Stephens, Forest fire causes and extent on United States Forest Service lands, 2005). The implementation of Alternative 1 would minimize the potential for these ignitions to grow into large scale destructive wildfires where they impact the proposed fuel treatments. Overall the implementation of Alternative 1 would enhance fire management's ability to contain, control and suppress wildfires spreading from private lands onto public land especially where they impact fuel treatment units thus decreasing the potential for large scale high severity fire in the Lakes Basin Project area.

Cumulatively the implementation of Alternative 1 will provide more fuel reduction treated acres that can perform as an anchor point for further future treatments enhancing and increasing the connectivity of treatments across the landscape.

Alternative 2 – Spotted Owl Habitat Management Alternative

Direct and Indirect Effects of Treatments to Improve Forest Health

Mechanical Thinning and Hand Thinning

Approximately 333 acres in HCRA that would be mechanically thinned under Alternative 1would be hand thinned under Alternative 2. Also, an additional 136 acres that are proposed for mechanical thinning under Alternative 1 would receive no treatment under Alternative 2. Therefore, a total of approximately 469 acres in both WUI defense zones and general forest under Alternative 2 would no longer be prescribed mechanical thinning. This change from mechanical thinning to hand thinning and no treatment would result in fewer acres meeting the desired conditions associated with forest health and resiliency. Stand densities, stand structure, species composition, and wildfire hazard issues would not be addressed on these acres.

Table 11 displays attributes of stands where prescribed treatments shifted from mechanical thinning to hand thinning. Since hand thinning only removes trees less than 11.0 inches DBH, overall TPA would be reduced. However, residual basal area and relative SDI would remain above the desired conditions described in the "Existing Conditions" section of the Lakes Basin Project Vegetation Report. Also, CBH and the probability of torching would be reduced but canopy

densities and potential mortality associated with wildfire (under severe conditions) would remain high (USDA 2018a).

Areas that change from mechanical thinning to hand thinning would be left at higher risk to density-related mortality, insects and disease and high levels of mortality associated with potential wildfire. Species composition would be slightly affected but conditions conducive (i.e. canopy openings) to promoting shade-intolerant conifers would not be created. Stands would maintain a homogeneous condition and would not meet the purpose and need of the project.

Cumulative Effects

Alternative 2 was developed to comply with the Draft Interim Recommendations for the Management of California Spotted Owl (CSO) Habitat on National Forest System Lands. It does so by shifting mechanical thinning treatments to hand thinning type treatments or no treatment within designated habitat acres for the CSO. Under Alternative 2, there would be a decrease in the number of acres within the project area shifting towards desired conditions of stand densities, stand structure, species composition and wildfire hazard in both WUI defense zones and general forest.

Like the Proposed Action, the cumulative effects of Alternative 2 also occur in the context of past, present, and foreseeable future actions. Past projects and events are reflected in the vegetation layer used to characterize the existing conditions (the baselines for analysis) in the analysis area. The same present and foreseeable future projects utilized for the Proposed Action apply to Alternative 2.

Overall, project area forest health and resistance and resilience to disturbance would be improved when compared to the No-action Alternative. However, since hand thinning removes only small trees, there would be a less beneficial cumulative effect at both the project level and landscape level when compared to the Proposed Action. Fewer acres would incur improved heterogeneity within the project area and landscape. Over time, the project area would continue to maintain a higher level of homogeneity compared to the Proposed Action. The Proposed Action would better meet the Purpose and Need of the Lakes Basin Project than Alternative 2.

Alternative 3 – No-Action Alternative

Direct and Indirect Effects of No Action

Measurement Indicator 1: Effective Fuels Reduction

Surface fuels, ladder fuels and canopy fuels would not be modified over the short term. Stand characteristics and predicted potential fire behaviors showed similar trends by dominant vegetation type over time. The predicted density based mortality of suppressed and intermediate size class trees, shedding of lower limbs and needles, and tree growth over time slowly contribute to increasing live crown base, leading to a slow increase in torching index over time. The predicted direct mortality from scorch and cambial damage does not account for post-fire mortality to fire-damaged trees due to insect and disease activity. Flame lengths remain greater than the desired 4 feet making direct suppression actions likely to be unsuccessful under

90th percentile (hot dry and windy) weather conditions. Surface fuel loading remains high thus, decreasing efficient productive human and mechanical line construction rates and decreasing the effectiveness of aerial retardant applications. At the landscape level, increased potential for short and long range spotting and the fire's influence on local weather tend to increase erratic fire behavior, resulting in increased fire size with higher tree mortality (Schroeder and Buck 1970). The above factors would decrease the effectiveness of initial attack by firefighters and extended fire suppression operations, leading to a greater potential for large, high-severity fires.

Effects on Firefighting Operations and Public Safety

The No-Action Alternative would result in no improvement in fire management's ability to safely suppress and contain fires, both in initial attack and extended fire suppression operations. Conditions would not be improved and would continue to decline over time due to continued increases in stand densities and continued surface fuel buildup. Under 90th percentile weather conditions, flame lengths would generally be at least 40 feet. Compare existing fire indices in Table 24 with the effect of No Action on change in fire indices over time in Table 48. The fireline handbook (NWCG 2004) notes that with 4-8 foot flame lengths "Fires are too intense for direct attack on the head by persons with hand tools. Handline cannot be relied on to hold fire." Eight feet and greater flame lengths, "Fire may present serious control problems: torching, crowning, and spotting; control efforts at the head will probably be ineffective." Under current heavy surface fuel loadings and high stand densities, the rates of line construction are relatively slow for both hand crews and mechanized equipment when compared with the post-treatment desired conditions (Proposed Action and Alternatives section). The above factors result in a negative effect on the overall ability of fire managers to safely suppress and contain fires, leading to increased mortality in all size classes, and cost to suppress a wildland fire. Modifications over the long-term would be primarily caused by high-mortality fires and drought and insect-related mortality.

Cumulative Effects of No Action

By taking no action, fire behavior is expected to result in high-mortality fires, with high-severity fire effects. Over the long term, mortality occurring in high-density stands would continue to increase surface fuel load through deadfall of standing dead trees. This increase in mortality and related deadfall has been witnessed in the Sierra Nevada range as a result of region-wide drought in the late 1980s (Guarin and Taylor, 2005). These increased surface fuels, combined with continuous ladder and canopy fuels, would continue to obstruct suppression effectiveness and would likely maintain stands in a condition susceptible to high-mortality fire. Increased flame lengths during a wildfire could lead to high mortality in forested areas, RHCAs, PACs, and HRCAs in the project area. In turn, this may result in continued high fire suppression and rehabilitation costs for the indefinite future in the Lakes Basin Project area. The No-action Alternative would not improve firefighter and public safety, which could lead to potential future injuries or fatalities during wildfire events. The No-action Alternative would also not reduce potential tree mortality or protect rare species and associated habitat from the major adverse effects of severe wildfire (Stephens and Moghaddas 2005; Agee 2002). Reasonably foreseeable fuel treatment projects (Appendix D) include several landscape level forest health projects, one

on the Tahoe National Forest (Yuba Project) and two on the Plumas National Forest (Haskell and Plumas Eureka). Four range allotments, fuel wood gathering, Christmas tree cutting, and recreational use also are ongoing activities. The No-action Alternative would allow stands to continue to develop under the influence of the legacy of past management practices and fire suppression (Agee and Skinner 2005). Overall, the No-action Alternative would trend conditions for fire behavior and predicted mortality away from the desired conditions described in Proposed Action and Alternatives section.

Under the No-action Alternative no connectivity with existing and future foreseeable adjacent projects would occur, reducing their intended effectiveness thereby decreasing their overall effectiveness at the landscape scale. Strategic placement of fuel treatments in relation to fire resistant landscape features would also not occur. The road infrastructure allowing access for fire suppression resources would continue to degrade impacting their ability to efficiently perform suppression activities.

Terrestrial and Aquatic Wildlife

The Lakes Basin Project Biological Assessment (BA) for the Sierra Nevada Yellow-legged Frog and Designated Critical Habitat (USDA 2017a) and the Lakes Basin Project Biological Evaluation (BE) for Terrestrial and Aquatic Wildlife (USDA 2018c) analyzes all threatened, endangered, proposed, and sensitive wildlife species whose habitat would be either directly or indirectly affected by the Lakes Basin Project area. These documents are incorporated by reference in their entirety and are available in the project record. This EA brings forward species of interest known to occur within the project area or assumed to be present. These species include: the Sierra Nevada yellow-legged frog, bald eagle, California spotted owl, northern goshawk, and Sierra marten.

Environmental Consequences

Sierra Nevada Yellow-Legged Frog (*Rana sierrae*)

Action Alternatives (Alternatives 1 and 2) Direct and Indirect Effects of Improving Forest Health and Forest Resiliency via Mechanical Treatments

Measurement Indicators 1 and 2: Acres of suitable habitat modified, lost or fragmented at various scales and Habitat components modified, lost or fragmented.

There are 2,249 acres of suitable habitat within the aquatic analysis area. This suitable habitat is around the lakes, ponds, perennial and intermittent creeks, as well as springs and wet meadows. Within suitable habitat, hand thinning would occur on 301 acres under Alternative 1 and 289 acres would be treated under Alternative 2, reducing the high concentration of fuels in these areas, as well as reducing competition for riparian vegetation. No mechanical equipment would be allowed within suitable habitat. Under both Action Alternatives, up to 2,404 acres could be treated through underburn only. The objective within the suitable habitat for SNYLF is to remove excess fuel (conifers), maintain microclimate, protect stream banks from disturbance, and retain key attributes such as riparian vegetation, down logs and large woody debris (LWD) recruitment, with the overall goal being to enhance the habitat and reduce the threat of loss through wildfire.

To achieve the above objective, suitable habitat would be designated on the sale area map. Hardwoods would be retained in all units, except where removal is necessary for operability. During follow up underburn activities, fire would be allowed to back into suitable habitat if the fuels naturally allow it to creep in. There would be no active ignition within suitable habitat.

Within the suitable habitat, burning intensities are expected to be light, due to restricted ignition, resulting in a mosaic of burned and unburned areas of suitable habitat. While there may be short-term loss of some sheltering habitat and riparian vegetation from backing fire, a greater long-term benefit is healthier riparian vegetation and the protection of the habitat from large stand-replacing wildfire. Again, applicable BMPs and S&Gs would be implemented.

Pile burning should have no direct effect on individuals since piles would be placed outside of the 82' habitat buffer to avoid impacts to SNYLFs. Since piles focus on removal of smaller sized fuels, existing larger diameter down woody debris would remain on site to provide for alternate sheltering and dispersal cover.

Vegetation management in the uplands can potentially change the hydrologic regime in the area. Soil erosion could direct sedimentation into streams that could create short-term unsuitable water quality that could disrupt habitat use by this species. However, with the implementation of standard and guidelines, BMPs, SMRs and project design elements, it is anticipated that there would be no disruption in flows and minimal short-term sedimentation into streams (refer to the Lakes Basin Project Water and Soil Resource Effects Assessment report, USDA 2018d).

Based on the Pesticide Fact Sheet prepared by Syracuse Environmental Research Associates, Inc. (2016), the application rate for Sporax or Cellu-treat used by the Forest Service is considered non-toxic to vertebrate species. Thus, Sporax or Cellu-treat applied to stumps under Alternative 1 or 2 should not affect SNYLFs.

Table 52. SNYLF Suitable Habitat that would be affected in Designated Critical Habitat

Treatment Type	Suitable Habitat (Acres)	Habitat Occupancy			Designated Critical Habitat Effected (Acres)	Suitable Habitat within DCH Effected (Acres)
		Utilized (Acres)	Utilization Unknown (Acres)	Unutilized Potential (Acres)		
Hand Thin within SNYLF	206	61	145	0	206	206
Underburn Only	339	56	283	0	2,404	339
All other treatments	0	0	0	0	814	0
Totals	545	117	428	0	3,424	545

Direct and Indirect Effects of Treatments to Improve Aspen Stands and Meadow Systems

Measurement Indicator 3: Changes in vegetation and aspen stand/ meadow characteristics.

There are 35 acres of wet meadow and 32 acres of aspen suitable habitat where only hand thinning would occur. All cut material would be hand piled outside of suitable habitat. Hand thinning activities could cause direct disturbance to individuals. Effects to the habitat would be the same as mentioned above, direct disturbance to individuals and vegetation during project activities. Indirect effects would be short-term loss of sheltering habitat and riparian vegetation and changes in the microclimate (reduced humidity, and increased air temperatures) due to the hand thinning and burning activities. However, the benefit of removing conifers, and therefore canopy cover, from wet meadows and aspen stands would be to provide improved basking sites for SNYLF's.

Direct and Indirect Effects of Treatments to Improve Watershed Conditions

Measurement Indicator 4: Changes in road density.

The habitat in the project area is currently fragmented from roads, including a major highway, and 47 miles of trails, and any new temporary roads will add to that fragmentation. Approximately 5 miles of new temporary roads and 6 miles of existing temporary roads would be used to provide access during project activities. No perennial or intermittent drainages would be crossed, and all temporary roads would be constructed away from SNYLF suitable habitat. Therefore no direct effects are anticipated. All BMPs and standard management requirements (SMRs) for roads would be followed so no direct effects are anticipated. These roads would be obliterated and seeded when no longer needed for the project, therefore any impacts of temporary roads are expected to be short-term, up to 5 years, for the vegetation to reestablish.

There are existing short spur roads, totaling 3.6 miles, that are contributing to habitat fragmentation. These roads would be obliterated which may entail culvert removal, subsoiling of the roadbed, recontouring the hillslope, and/or seeding the affected area. These measures help initiate re-vegetation and recovery of the road area, over time, producing less sediment and surface runoff to adjacent stream courses. All applicable S&Gs and BMPs would be followed during road obliteration and maintenance activities, minimizing any effects of these activities on SNYLFs.

Cumulative Effects of Action Alternatives

Future activities on NFS lands include ongoing recreation throughout the Lakes Basin area. These activities are expected to increase over time. The main impacts to SNYLFs are trampling of shoreline and stream bank vegetation and direct disturbance to individual frogs along shorelines, stream banks and trail crossings.

The Plumas-Eureka Project on the Plumas National Forest and the Yuba Project on the Tahoe National Forest, adjacent to the Lakes Basin Project, are expected to have similar short-term negative effects to suitable habitat, trampling of vegetation, and similar long-term benefits of healthier forest and riparian habitats.

Mills Peak Trail South project proposes to bring a non-system, user made trail into the system and add new construction to connect it to Mills Peak Trail North. This project would be designed to keep the trail outside of the 82' buffer of suitable habitat, therefore effects should be minimal to SNYLFs.

The fuelwood gathering program on the Plumas National Forest has been in existence for years and is expected to continue. This activity results in the cumulative loss of snag and down log habitat components across the landscape. Snag and log removal is most common along, or within a short distance from, open roads. Obliteration of roads under either Action Alternative would reduce the area accessible for woodcutting. The past and future effect of these actions has and would be to remove habitat structure used by wildlife.

The entire project area is used by the public, being in and adjacent to the Lakes Basin Recreation Area. Most of the recreation use within the aquatic wildlife analysis area consists of camping in campgrounds, dispersed camping, fishing, hiking, horseback riding, boating, hunting, mountain biking, pleasure driving, and wildlife watching. These uses are expected to continue and increase. As previously mentioned, there are 47 miles of trails in within the project boundary. The true extent and effect of these activities on SNYLFs is not known.

Alternative 3 – Direct and Indirect Effects of No Action

There would be no direct effects on SNYLFs or their habitat, as no activities would occur that would cause disturbance to individual SNYLF, nor any impacts to the existing habitat conditions.

Indirect effects of no action would be keeping the poor overall health of overstocked stands, not thinned under this alternative, and allowing the continued encroachment of conifers into riparian areas. No work would be done to bring species mix and stocking more in line with historical conditions, where fire can play a role in habitat recovery instead of being catastrophic. Any acres burned at high-intensity could contribute to increased sedimentation, which would adversely affect aquatic habitats and individual SNYLFs.

There would be no actions taken to improve the health and vigor of aspen stands, or to keep wet meadows from drying out and converting to forest stands.

There would be no action taken to obliterate and/or reconstruct roads, or replace or install culverts. Roads causing resource damage would continue to fragment the hydrology and aquatic habitat as well as contribute to poor water quality.

Cumulative Effects of No Action

The No Action Alternative for the Lakes Basin Project would not protect or enhance SNYLF habitat. There would be no actions designed to enhance riparian habitat or reduce the risk of high-intensity wildfire. There is the potential for Riparian Conservation Areas (RCAs) to act like chimneys and carry fire up and down the watershed.

Determinations for Sierra Nevada Yellow-legged Frog

Action Alternatives – Alternatives 1 and 2

Implementing either of the Action Alternatives (Alternatives 1 or 2) for the Lakes Basin Project May Affect and is Likely to Adversely Affect the Sierra Nevada yellow-legged frog. This determination is based on the following:

- While no mechanical equipment would be allowed within suitable habitat, hand thinning and underburning activities would occur. All S&Gs, BMPs and Limited Operating Periods (LOPs) and other project specific design features would be followed, however, suitable habitat would be impacted through trampling and loss to underburning and individuals could be harmed or harassed during project activities.

Implementing either of the Action Alternatives (Alternatives 1 or 2) for the Lakes Basin Project May Affect and is Likely to Adversely Affect designated critical habitat. This determination is based on the following:

- Project activities would occur in critical habitat. All S&Gs, BMPs and LOPs and other project specific design features would be followed, however, critical habitat would be impacted through use of mechanical equipment, trampling and short term loss to underburning.

No Action Alternative

Not implementing the Lakes Basin Project will not affect the Sierra Nevada yellow-legged frogs. This alternative is not without risk to SNYLF habitat and individuals, especially in the mixed conifer stands, as no action is taken to reduce stocking levels of conifers in suitable SNYLF habitat, which over time leaves riparian areas along creeks, wet meadow and aspen habitat vulnerable to conversion to forested stands of conifers. Over stocked forested stands would continue to leave the existing SNYLF habitat vulnerable to the threat of a high-intensity wildfire.

Bald Eagle *(Haliaeetus leucocephalus)*

Action Alternatives (Alternatives 1 and 2) Direct and Indirect Effects of Improving Forest Health and Forest Resiliency via Mechanical Treatments

Measurement Indicators 1 and 2: Acres of suitable habitat modified, lost or fragmented at various scales and Habitat components modified, lost or fragmented.

No timber harvest activities (mechanical or hand thinning) would occur within the Gold Lake bald eagle territory. The closest project activities associated with harvest activities are on the south side and east end of Gold Lake, a half mile or more away. These activities, therefore, would have no direct or indirect effects to bald eagles. The only activity that would occur in and near the bald eagle territory is underburning. There would be a Limited operating period for the eagle territory of January 1 through August 31st. In addition, due to recreation activities, any underburning would probably be done in late fall, therefore underburning would have no direct effect on bald eagles. Any indirect effects of underburning would be beneficial for bald eagle habitat. Underburning targets small understory trees which would reduce competition for the

larger trees. This allows for better growth and healthier trees in the residual forest, providing for large nest trees into the future.

Direct and Indirect Effects of Treatments to Improve Aspen Stands and Meadow Systems

Measurement Indicator 3: Changes in vegetation and aspen stand/ meadow characteristics.

There are no aspen stands or meadows units within the bald eagle territory; therefore there would be no direct or indirect effects on bald eagles or bald eagle habitat due to aspen/meadow improvements.

Direct and Indirect Effects of Treatments to Improve Watershed Conditions

Measurement Indicator 4: Changes in road density.

There are no roads within the bald eagle territory; therefore there would be no direct or indirect effects on bald eagles or bald eagle habitat due to road management activities.

Cumulative Effects of the Action Alternatives

The existing condition reflects the changes of all activities that have occurred in the past. The analysis of cumulative effects of the proposed action evaluates the impact on sensitive species habitat from the existing condition within the aquatic wildlife analysis area.

Current and future activities on NFS lands include ongoing recreation throughout the Lakes Basin area. These activities are expected to increase over time. Currently there are no roads or trail within the bald eagle territory, therefore the only impacts are to foraging eagles competing with all the boating, fishing, jet skiing, etc. on Gold Lake. All of the recreation activities are expected to continue.

The Plumas-Eureka and Haskell Projects on the Plumas National Forest and the Yuba Project on the Tahoe National Forest, adjacent to the Lakes Basin Project, are not expected to impact the bald eagles at Gold Lake.

Road work on the Gold Highway would contribute minimally to cumulative effects on the bald eagles from the noise during implementation near Gold Lake.

The Mills Peak Trail South Project is not within the bald eagle territory and is not expected to impact bald eagles at Gold Lake.

There is no fuelwood gathering or Christmas tree cutting in or near the bald eagle territory.

As mentioned above, the entire project area is heavily used by the public, being in and adjacent to the Lakes Basin Recreation Area. Most of the recreation use near the bald eagle territory consists of camping in campgrounds, fishing, hiking, horseback riding, boating, hunting, mountain biking, and wildlife watching. These uses are expected to continue and increase. The true extent and effect of these activities on bald eagles is not known.

Alternative 3 – Direct and Indirect Effects of No Action

There would be no direct effects on bald eagles habitat, as no activities would occur that would cause disturbance, nor any impacts to the existing habitat conditions. The Gold Lake Territory is at approximately 6500' elevation, where past management activities have been limited, therefore there would be very little indirect effects, if any, of the No Action Alternative.

Cumulative Effects of No Action

Since there are no direct or indirect effects as a result of the No Action Alternative for the Lakes Basin Project, there would be no cumulative effects on bald eagle habitat.

Determinations for Bald Eagle

Action Alternatives – Alternatives 1 and 2

Implementing either of the Action Alternatives (Alternatives 1 or 2) for the Lakes Basin Project would have no effect on Bald Eagles. This determination is based on the following:

- No timber harvest activities within or adjacent to the bald eagle territory.
- Underburning occurring outside of the bald eagle LOP.

No Action Alternative

Not implementing the Lakes Basin Project will not affect bald eagles or habitat for bald eagles.

California Spotted Owl *(Strix occidentalis occidentalis)*

Within the Lakes Basin Project area, either Action Alternative would result in an increase in low contrast fragmentation; that is dense canopy cover would be reduced within the WUI and General Forest units but would maintain the largest trees within treated stands and across the landscape. According to the 1993 California Spotted Owl IG EA (Page IV-81), within stand fragmentation of the small tree canopy (trees <20 to 30 feet tall) is less of a concern than large tree or old forest attribute removal because:

1. Historical understory densities were discontinuous;
2. This habitat component can return relatively quickly (versus large overstory layer); and
3. Creating this type of fragmentation can help avoid larger scale, high contrast fragmentation of forested stands caused by large stand-replacing wildfire.

The key to lessening impacts of fragmentation within WUI and General Forest treatments is to maintain forest cover composed of the largest, fire resistant conifer species, while also providing structural attributes needed for prey species (snag/large logs, some smaller trees). Project activities would target the removal of trees up to 18 inches DBH. Trees larger than 18 inches DBH would be removed as needed to bring the species mix to a more natural balance, removing larger, shade-tolerant species such as white fir and incense cedar, and retaining larger pines.

The Action Alternatives (1 and 2) would not allow mechanical treatment in spotted owl Protected Activity Centers (PACs). Under either Action Alternative, only the Mills Peak PAC and

Home Range Core Area (HRCA) would have treatments of any kind. The Bear Wallow PAC/HRCA is not within treatment units and would only be indirectly affected by the Lakes Basin Project. Both action alternatives include design features to protect spotted owls from disturbance during implementation (Limited Operating Periods - LOPs). Alternative 2 includes several additional design criteria recommended in the IR, including:

1. No mechanical treatment would occur within the designated habitat acres for the spotted owl (within PACs or HRCAs), (USDA 2015, p. 17, #6a)
2. No overstory tree removal in PACs or HRCAs, including the retention of trees ≥ 30-in diameter except in circumstances where public safety is at risk as a result of tree fall. (USDA 2015, p. 17, #6a). For Alternative 2, there will be no overstory tree removal in PACs or HRCAs, as only hand thinning is proposed.

Table 53. Acres of spotted owl Protected Activity Centers (PACs) and Home Range Core Areas (HRCAs) in the Lakes Basin wildlife analysis area.

Site Number	PAC Acres	PAC Acres in Units	HRCA Acres	HRCA Acres in Units	Total Acres	Total Acres in Units
PLU0012	315	18*	718	425	1,033	443
PLU0206	303	0	711	0	1,014	0
Total	618	18*	1,429	425	2,047	443

*PLU0012 would have hand thinning in the PAC under Alt 1, no treatment in the PAC under Alt 2.

Alternative 1 *- Direct and Indirect Effects of Improving Forest Health and Forest Resiliency via Mechanical Treatments*

Measurement Indicators 1 and 2: Acres of suitable habitat modified, lost or fragmented at various scales and Habitat components modified, lost or fragmented.

Effects of Mechanical Thinning, Grapple Pile

Potential direct effects on the spotted owl may result from the modification or loss of habitat or habitat components. In addition, disturbances associated with logging, temporary road building, or other associated activities within or adjacent to occupied habitat may disrupt nesting, fledging, and foraging activities. Implementation of Limited Operating Periods (LOPs) around known spotted owl nests would minimize the effects to existing owl pairs associated with direct disturbance on treatment units and access routes.

Currently the suitable foraging habitat averages approximately 54% canopy cover of dense, medium sized trees in the mixed conifer habitat. Both Action Alternatives propose to use variable density mechanical thinning within suitable foraging habitat, which would create lower density stands with larger average tree diameter that are more resilient to insect, disease and wildfire, while enhancing heterogeneity that may be important to spotted owls and their prey. Mechanical treatments that produce complex forest structure and composition closer to patterns generated under a more active fire regime, may have less of a negative impact on spotted owl habitat than traditional thinning practices. (North et al. 2009, Stephens et al. 2014).

Treatments could result in short-term adverse effects to spotted owls and suitable habitat from logging activity and post project activities (underburning and road decommissioning). Proposed treatments would open up the forest habitat but does not isolate stands from surrounding forest or create habitat islands isolated by non-forest, thus keeping habitat connectivity and increasing the likelihood for successful dispersal of wildlife. Spotted owl survival reproductive rates have been found to be higher in territories that included a mosaic of vegetation types among late seral forest, presumably because of the greater diversity or abundance of prey within this mosaic (North, 2012).

For Alternative 1, within the WUI defense zone, adjacent to the town of Graeagle, canopy cover would drop below 40% on 298 acres. WUI treatment, along with 32 acres of aspen treatment in suitable habitat, would change 330 acres of suitable habitat to unsuitable. All foraging habitat (outside of WUI defense), would remain suitable with an average canopy cover of 45%. Prescriptions outside of the WUI would be written to maintain the overstory at an average of 40%-45% canopy cover, as well as maintain large snags and downed logs.

Overall canopy cover would be reduced, but the largest, tallest trees would be retained to grow into the large tree category for future nesting habitat and the foraging habitat would be enhanced. North et al (2017) found that the height of the canopy cover was more important than total canopy cover, and that retention and promotion of large trees and the cover provided by them may more directly benefit owl habitat. Under this Alternative, the PAC would have 18 acres of hand thinning (up to 11 inches DBH) along the eastern edge. Overall, Alternative 1 would result in a loss of 330 acres of 4D and 4M foraging habitat changing to unsuitable (Table 6 in the Lakes Basin Project Biological Evaluation Terrestrial and Aquatic Wildlife (USDA 2018c).

The long-term effects of the Proposed Action (Alternative 1) would be beneficial to individuals and their habitat as forested stands would be at a healthier stocking level, post-project, which would help to grow and maintain suitable spotted owl habitat on the landscape. By opening up the canopy, it would allow for the growth of understory forbs and shrubs, creating more diverse foraging habitat for prey species. Thus, effects to spotted owls and their habitat in the short term would be outweighed by the long-term benefits of greater structural diversity of stands and reduced potential for stand-replacing die off from insect, disease, or high severity fire.

Based on the Pesticide Fact Sheet prepared by Syracuse Environmental Research Associates, Inc. (2016), the application rate for either Sporax or Cellu-treat used by the Forest Service is considered non-toxic to vertebrate species. There are no known effects on California spotted owls from either Sporax or Cellu-treat applied to stumps.

Effects of Hand Thinning

Under Alternative 1, 18 acres would be hand thinned, up to 11 inches DBH, at the eastern boundary of the PAC, maintaining suitable habitat. It is anticipated that most trees cut would be less than 8 inches, however, an upper diameter of 11 inches DBH gives more flexibility in removing ladder fuels next to a highly used road, contributing to lowered fire risk in both the short- and long-term. Not all trees up to 11 inches DBH would be cut which would result in

minimal loss of canopy cover. Implementation of LOPs within 0.25 mile of spotted owl activity centers and active nests should lessen any potentially disturbing effects associated with project activities.

Effects of Underburning

Disturbance due to smoke, and noise related to activities such as line construction adjacent to occupied habitat may disrupt nesting, fledging, and foraging activities. Implementation of seasonal LOPs around spotted owl activity centers would partially offset any potentially disturbing effects associated with underburning activities. In addition, no underburning would occur within the PAC. Prescribed burns would consume logs and snags within units that provide potentially suitable habitat. However, snags and downed logs could be recruited through the prescribed burning process so both the short- and long-term effects would be negligible.

Post project underburning could occur on 1,935 acres of suitable foraging habitat as follow-up to thinning treatments within the analysis area and on approximately 464 acres of suitable foraging habitat in the underburn only treatment. Recent research suggests that spotted owls are not adversely affected by low- to moderate-severity fire (Roberts et al. 2011, Lee et al. 2013), and will select burned areas of all severities over unburned areas for foraging, and will select low-intensity burned areas for roosting (Bond et al. 2009). Prescribed burning would contribute to lower fire risk in both the short- and long-term, and may be beneficial in creating desirable habitat conditions for spotted owl prey species.

Lee and Irwin (2005) suggest that modest fuel reduction treatments in the Sierra Nevada would not be expected to reduce canopy cover sufficiently to have measureable effects on owl reproduction, but did find that lethal fire simulations produced a pronounced and lasting negative effect. Jones et al. (2016) found that high severity fire had a strong negative impact on spotted owls, demonstrated both by avoidance of high severity burned areas by foraging owls and by a drastic increase in site extirpation. The main purpose of the Lakes Basin Project is to reduce the overstocking of stands, which contribute to forest health issues and hazardous fuel accumulations, and can impact wildlife habitat by contributing to die-off of trees from insect and disease outbreaks and/or severe wildfires. An analysis of modeled wildfire hazard in the mixed conifer habitat of the Lakes Basin Project found that 99% of the acres are at high risk for stand-replacing wildfire.

Alternative 2 *- Direct and Indirect Effects of Improving Forest Health and Forest Resiliency via Mechanical Treatments*

Measurement Indicators 1 and 2: Acres of suitable habitat modified, lost or fragmented at various scales and Habitat components modified, lost or fragmented.

Effects of Mechanical Thinning, Grapple Pile

No mechanical treatment would occur in any designated spotted owl habitat under Alternative 2. Overall, mechanical thinning would drop by 468 acres (351 acres would become hand thinning within designated habitat and 117 acres would have no treatment within designated habitat). While hand thinning only would have little direct impact to current designated spotted owl

habitat, by not thinning the overstocked stands of medium sized trees, the habitat would remain marginally suitable. Overstocked stands do not allow for healthy growth of overstory trees or of understory forbs and shrubs important for many prey species. The 142 acres (117 acres from dropped mechanical thin treatment and 25 acres from dropped hand thin treatment) of no treatment is an area that expands the no treatment buffer around the nest core for the Graeagle Goshawk PAC up to the Mills Peak Spotted Owl PAC. Outside of designated habitat, mechanical thinning would occur on 1,646, acres of suitable foraging habitat, and would have the same direct and indirect effects described under Alternative 1.

Table 54. Comparison of treatments between alternatives in suitable spotted owl habitat within the Lakes Basin wildlife analysis area.

CWHR Size, Density	Habitat Suitability	Alt 1 Hand-Thin Treatment	Alt 1 Mechanical Treatment	Alt 2 Hand-Thin Treatment	Alt 2 Mechanical Treatment	Alt 2 No Treatment
5M, 5D, 6	Nesting	11	0	11	0	0
4M, 4D	Foraging	690	2,114	1,016	1,646	142
Total		701	2,114	1,027	1,646	142

Effects of Hand Thinning

Under Alternative 2, treatment in designated spotted owl habitat would change from mechanical thinning to hand thinning up to 11 inches DBH on 351 acres, including 91 acres, within the WUI defense zone. Under this alternative, 25 acres (18 acres of hand thinning in the PAC and 7 acres of hand thinning in SNYLF habitat) in Alternative 1 would change to no treatment. Hand thinning up to 11 in DBH could move some 4D stands with 60-62% overall canopy cover to 58-59% (4M), but would be important to open up the lower story and lessen fuel loadings. Spotted owl habitat would benefit in the short term from reduced number of trees compared to current conditions by opening up the lower story which would enhance foraging ability. However, thinning just within the small trees would not improve overall forest health or allow for heterogeneity within the designated habitat that mechanical treatments would. The IR recognizes that providing some opportunity for habitat heterogeneity could improve habitat quality.

Effects of Underburning

Same effects as Alternative 1.

Direct and Indirect Effects of Treatments to Improve Aspen Stands and Meadow Systems

Measurement Indicator 3: Changes in vegetation and aspen stand/ meadow characteristics.

Under either Action Alternative, the aspen/meadow improvement would have a direct effect on spotted owl habitat with the mechanical removal of larger conifers (<30” inches DBH), on 32 acres of foraging habitat. However, the removal of conifers from aspen stands and meadows would promote healthy growth of new younger aspen, or meadow vegetation, and improve the

current conditions of these important habitat types, thus improving overall habitat diversity for spotted owls and their prey species.

Direct and Indirect Effects of Treatments to Improve Watershed Conditions

Measurement Indicator 4: Changes in road density.

Under either Action Alternative, temporary road construction would cause increased fragmentation of the habitat. These roads would be decommissioned and seeded when no longer needed for the project, therefore any impacts of temporary roads are expected during project activities and up to 5 years post project, for the vegetation to reestablish. Actions, including road obliterations and seeding with native vegetation, would have a positive effect on spotted owls by facilitating vegetation recovery and lessening fragmentation of the habitat. Reducing open road densities to 2.0 miles/square mile, post-project would have a positive effect, reducing human activities that often reduce habitat suitability for many species, including spotted owls.

Cumulative Effects (of Alternative 2 or both Alt 1 and 2?)

Cumulative effects on spotted owls could occur with the incremental loss of the quantity and/or quality of habitat for this species. Overall, increases in urbanization, increases in recreational use of National Forest System lands, and the utilization of natural resources on state, private and federal lands may contribute to habitat loss for this species.

Future activities on National Forest System lands include the Plumas-Eureka and Haskell Projects on the Plumas National Forest and the Yuba Project on the Tahoe National Forest, adjacent to the Lakes Basin Project, are expected to have similar short-term negative effects to suitable habitat, removal of medium sized trees, opening up the forest canopy, and similar long-term benefits of healthier forest and riparian habitats.

Road work on the Gold Lake Highway is expected to have no effect on spotted owls and their habitat.

The Mills Peak Trail South project, as proposed, would add to the number of miles of trails (47) in the Lakes Basin area. These trails fragment the habitat and bring more human to disturbance to all wildlife species in the area.

The Lakes Basin Project area, as well as the wildlife analysis areas, has areas open to woodcutting and Christmas tree cutting but amounts are not quantifiable. This area is heavily used by the public and these activities are expected to continue. Snags and down logs would continue to be removed, resulting in the cumulative loss of these habitat components across the landscape. Snags are recruited annually from live trees through natural processes at a rate that may sustain this loss within the terrestrial wildlife analysis area. Snag and log removal is most common along, or within a short distance from, open roads, therefore; obliteration of roads under either Action Alternative would reduce the area accessible for, and the impact of, woodcutting. The past and future effect of these actions has and would be to remove habitat structure used by wildlife.

As mentioned above, the entire project area is heavily used by the public, being a recreation area. Most of the recreation use within the wildlife analysis area consists of camping, fishing, hiking, horseback riding, hunting, mountain biking, pleasure driving, and wildlife watching. These uses are expected to continue. The true extent and effect of these activities on the California spotted owl is not known.

Alternative 3 – Direct and Indirect Effects of No Action

There would be no direct effects on spotted owl or spotted owl habitat, as no activities would occur that would cause disturbance to nesting or foraging birds, nor any impacts to the existing habitat conditions.

Indirect effects of no action would be continued poor overall health of overstocked stands, not thinned under this alternative, slowing the progression of the habitat to the old growth stage, needed for successful spotted owl occupancy and productivity. No work would be done to bring species mix and stocking more in line with historical conditions, where fire can play a role in habitat recovery instead of being potentially stand replacing.

The current Plumas National Forest woodcutting program is expected to continue, resulting in the cumulative loss of snag and down log habitat components across the landscape. Snag and log removal is most common along, or within a short distance from, open roads. With the no action alternative, no roads would be obliterated to lessen the impact of woodcutting and public use within the areas used by spotted owls, especially during the nesting season.

There would be no action taken to improve the health and long-term viability of aspen stands and meadows in the wildlife analysis area. While succession to conifer stands could provide future nesting habitat for spotted owls, the loss of diversity that aspen and meadows provide for many wildlife species would have a much greater overall negative affect on the landscape as a whole.

There would be no direct effects on the spotted owls or their habitat, as no new temporary roads would be built that would cause disturbance to foraging or nesting, nor any new impacts to the existing habitat conditions. There would be no action taken to decommission existing non-system roads, thus maintaining the current road density of approximately 2.3 miles/square mile. Roads would continue to fragment the terrestrial habitat decreasing suitability of the habitat through disturbance.

Cumulative Effects of No Action

The No Action Alternative for the Lakes Basin Project would not provide for the long-term protection of spotted owl habitat from losses due to drought or insect outbreaks in overstocked stands. There would be no thinning that could enhance the growth of dominant and co-dominant (20-30 inches DBH) trees that may provide future habitat availability. There would be no actions designed to reduce the risk of high-intensity wildfire. Total wildfire acres, at possible high intensity, are anticipated to increase from current levels under this alternative (based on

analysis conducted in SNFPA (USDA 2001)), which could lead to lower owl abundance from existing condition within the terrestrial wildlife analysis area.

Determinations for California Spotted Owl

Action Alternatives – Alternatives 1 and 2

Implementation of either of the Action Alternatives for the Lakes Basin Project may affect individuals, but is not likely to result in a trend toward Federal listing or loss of viability for the California spotted owl. This determination is based on the following:

1. Retention of a minimum 95% of existing foraging habitat and 100% existing nesting habitat on 14,566 acres of NFS within the terrestrial wildlife analysis area. This retention of nesting and foraging habitat outside the existing PACs would provide opportunities for future occupancy and population expansion;

2. Bringing forested stands to a stocking level and species mix closer to historic conditions that should allow for maximum growth and vigor of trees, and therefore future suitable nesting habitat.

Both Action Alternatives would have direct impacts to the current suitable foraging habitat, removing trees and breaking up the continuous canopy of trees, improving forested stands in the long term. Alternative 1 would directly affect 468 more acres than Alternative 2 through mechanical treatment, therefore, more acres would benefit in the long term from healthier stocking levels of trees, and faster transition into suitable nesting habitat and more resilient to a stand-replacing event than Alternative 2.

It is acknowledged that implementation of either Action Alternative involves some risk to habitat and subsequent uncertainty with regards to owl activity. Based on the amount of suitable habitat affected and the expected habitat condition post treatment (improved forest health and resiliency), either Action Alternative provides less long-term risk to spotted owls than the No Action Alternative.

No Action Alternative

Not implementing the Lakes Basin Project will not directly affect individual California spotted owls. Alternative 3 is not without risk to spotted owl habitat, as no action is taken to reduce existing fuel levels, improve the overall health of forested stands, and leaves existing owl habitat vulnerable to large scale fragmentation as a result of insect, disease or wildfire.

Northern Goshawk (*Accipiter gentilis*)

There are three, approximately 200 acre, PACs that are located within the terrestrial wildlife analysis area. PACs are designated from aerial photos and additional acres are the result of designating the best available habitat in relationship to geographical features and stand continuity. PACs are delineated based on guidelines provided in the SNFPA FEIS 2001 ROD and the SNFPA FSEIS 2004 ROD page 38. Where there is insufficient suitable habitat (6, 5D, 5M, 4D

and 4M), to meet the 200 acre guideline for a PAC, the next best vegetation sizes and types are included.

Implementation of either Action Alternative during the nesting season around known nest sites could cause disturbance that could disrupt nesting behaviors and potentially lead to nest failure. The risk of this occurring is tempered by the delineation of a PAC around known nest sites and implementation of a LOP prohibiting disturbing activities from occurring within ¼ mile of the PAC or active nest site.

Under either Action Alternative, all three goshawk PACs would be entered. Two PACs (Mohawk Creek and Graeagle) are completely within proposed mechanical treatment units. The third, Gold Lake, would have 117 acres treated, through a combination of mechanical thinning, hand thinning and underburning only. There would be a 500' foot no treatment buffer around all nest cores.

Action Alternatives (Alternatives 1 and 2) Direct and Indirect Effects of Improving Forest Health and Forest Resiliency via Mechanical Treatments

Measurement Indicators 1 and 2: Acres of suitable habitat modified, lost or fragmented at various scales and Habitat components modified, lost or fragmented.

Effects of Mechanical Thinning, Grapple Pile

Potential direct effects on the northern goshawk may result from the modification or loss of habitat or habitat components, and rarely from direct mortality if nest trees are felled. All nest trees, active and historic, that have been found during stand searches have been marked, and would have a no treatment buffer placed around them. In addition, disturbances associated with logging, temporary road building, or other associated activities within or adjacent to occupied habitat may disrupt nesting, fledging, and foraging activities (Richardson and Miller 1997). Implementation of Limited Operating Periods (LOPs) around known goshawk nests would remove the effects associated with direct disturbance during the breeding season on treatment units and access routes.

Alternative 1 would include mechanical treatment on 441 acres and Alternative 2 would include treatment on 359 acres within PACs. Except for 37 acres in WUI defense zone, all nesting habitat would remain suitable after thinning, but would be reduced in total canopy cover. Outside of PACs, Alternative 1 would include mechanical treatment on 1,776 acres of suitable nesting habitat, Alternative 2 would include treatment on 1,308 acres. Again, on all acres except WUI defense zone (37 acres), the suitable habitat would remain, with a reduced canopy cover. Dense stands of >60% canopy cover would be dropped to an average of 40-45% canopy cover, with some areas remaining over 60%. While in the short term, mechanical treatments would reduce the suitability of some goshawk nesting habitat, over the long term, nesting habitat should be improved. Bosakowski (1999) noted one study that recommended thinning with variable spacing to provide spatial heterogeneity characteristics of old-growth. In addition, goshawk productivity is closely associated with prey species abundance. Richer prey communities allow goshawks to exploit alternate prey species when preferred prey items are scarce (Salafsky, et al, 2006). An

abundant and diverse prey base is reduced when forest composition and structure limits the prey species habitat or accessibility to prey by the goshawks. Thinning dense stands would enhance foraging habitat, through enhanced growth of understory shrubs and forbs allowing for a greater diversity of prey species.

Table 55. Comparison of treatments between alternatives in northern goshawk Protected Activity Centers (PACs) within the Lakes Basin Project Area.

PAC Name	Acres in PAC	PAC Acres in Units	Alt 1 Hand-Thin Treatment	Alt 1 Mechanical Treatment	Alt 2 Hand-Thin Treatment	Alt 2 Mechanical Treatment
Graeagle	253	175	13	162	69	80
Mohawk Cr	283	211	11	200	11	200
Gold lake	200	82	3	79	3	79
Total	**736**	**468**	**27**	**441**	**83**	**359**

Based on the vegetation layer and the CWHR model, about 2,527 acres or 17% within the terrestrial wildlife analysis area on NFS lands may be considered suitable goshawk foraging habitat (3M, 3D, 4P, 5P) and about 6,134 acres or 42% within the terrestrial wildlife analysis area on NFS lands may be considered suitable goshawk nesting habitat (4M, 4D, 5M, 5D, 6). The changes to suitable habitat as a result of implementing either Action Alternative would be as follows: Overall nesting habitat, through the reduction of canopy cover down to less than 40%, would be reduced by 37 acres in the WUI defense zone, becoming foraging habitat. Prescriptions outside of the WUI would be written to maintain the overstory at an average of 40%-45% canopy cover, as well as maintain large snags and downed logs. Mechanical thinning would result in a loss of some canopy cover, but would maintain suitability for nesting. In addition, variable density thinning is designed to provide structural complexity through a mosaic of treated and untreated areas throughout each treatment unit, enhancing heterogeneity that may be important to goshawks and their prey. The total amount of habitat post project (2,564 acres (102%) foraging and 6,097 acres (99%) nesting) allows opportunities for future dispersal, nesting and foraging within the terrestrial wildlife analysis area. Proposed treatments would open up the forest habitat but does not isolate stands from surrounding forest or create habitat islands isolated by non-forest, thus keeping habitat connectivity and increasing the likelihood for successful dispersal of wildlife. Table 56 shows a comparison of the Action Alternatives with respect to mechanical and hand thinning treatments in suitable goshawk habitat.

Table 56. Comparison of treatments between alternatives in suitable goshawk habitat within the Lakes Basin Project wildlife analysis area.

CWHR Size, Density	Habitat Suitability	Alt 1 Hand-Thin Treatment	Alt 1 Mechanical Treatment	Alt 2 Hand-Thin Treatment	Alt 2 Mechanical Treatment
4M, 4D	Nesting	466 ac.	1,776 ac.	792 ac.	1,308 ac.
5P, 4P, 3D, 3M	Foraging	114 ac.	197 ac.	114 ac.	197 ac.
Total		**580 ac.**	**1,973 ac.**	**906 ac.**	**1,505 ac.**

Goshawk prey species (small mammals, birds) respond differently to opening up forested stands. Based on CWHR modeling, it is known that several bird species respond favorably to either less dense forested stands and/or openings within forested stands, while some do not (USDI 1999). Post project monitoring would provide valuable information on the response of goshawk prey species to General Forest thinning.

The project area is currently low in large snags and down logs. In terms of acres treated, with the subsequent potential for snag removal, Alternative 1 would treat more acres mechanically, therefore it is expected that Alternative 1 could have a more negative effect on existing habitat components than Alternative 2.

Based on the Pesticide Fact Sheet prepared by Syracuse Environmental Research Associates, Inc. (2016), the application rate for either Sporax or Cellu-treat used by the Forest Service is considered non-toxic to vertebrate species. There are no known effects on northern goshawks from either Sporax or Cellu-treat applied to stumps.

Effects of Hand Thinning

Under either Action Alternative, it is anticipated that most trees cut would be < 8, however, an upper diameter of 11 inches DBH gives more flexibility in removing understory trees to reach the desired species mix. Not all trees up to 11 inches DBH would be cut which would result in minimal loss of canopy cover. Noise disturbance associated with human presence and chainsaw use may disrupt nesting, fledging, and foraging activities. Implementation of LOPs within 0.25 mile of goshawk activity centers and active nests would reduce any potentially disturbing effects associated with project activities.

Northern goshawks prefer high canopy cover with open understory. Hand thinning would provide considerable benefit to goshawks through removal of small diameter trees creating more open understory conditions, while leaving the overstory unchanged. Alternative 1 would include hand thinning of 580 acres, Alternative 2 would include hand thinning of 906 acres. Proposed activities could cause short-term displacement as well as disruption of foraging activities (outside of the breeding season) due to noise disturbance and increased human presence.

Effects of Underburning

Disturbance due to smoke, and noise related to activities such as line construction adjacent to occupied habitat may disrupt nesting, fledging, and foraging activities. Implementation of seasonal LOPs around activity centers would offset any potentially disturbing effects associated with underburning activities during the breeding season. Prescribed burns would consume logs and snags within units that provide potentially suitable habitat. However, snags and downed logs could be recruited through the prescribed burning process so both the short- and long-term effects would be negligible.

Post project underburning could occur on up to approximately 1,614 acres of suitable nesting habitat and 197 acres of suitable foraging habitat as follow-up to thinning treatments within the

analysis area and on approximately 463 acres of suitable nesting habitat and 403 acres of suitable foraging habitat in the underburn only treatment. Prescribed burning would contribute to opening up the understory for growth of shrubs and forbs, and may be beneficial in creating desirable habitat conditions for goshawk prey species.

Direct and Indirect Effects of Treatments to Improve Aspen Stands and Meadow Systems

Measurement Indicator 3: Changes in vegetation and aspen stand/ meadow characteristics.

Improving aspen habitat through thinning (either Action Alternative) may have short-term negative impacts, by removing potential nesting habitat, but natural ecological recovery should reinvigorate the stand's growth, providing large aspen in the future that is suitable nesting for goshawks. In addition, the removal of conifers would promote increased regeneration of healthier aspen. Healthy aspen stands provide a diverse habitat for many species, including goshawk prey species. Thus foraging habitat for goshawks would be improved, as well as overall diversity in the wildlife analysis area.

Direct and Indirect Effects of Treatments to Improve Watershed Conditions

Measurement Indicator 4: Changes in road density.

Actions, including road obliterations and seeding with native vegetation, would have a positive effect on goshawks by facilitating vegetation recovery and lessening fragmentation of the habitat. Reducing open road densities to 2.0 miles/square mile, post-project would have a positive effect, reducing human activities that often reduce habitat suitability for many species, including goshawks.

Cumulative Effects of No Action

The existing condition reflects the changes of all activities that have occurred in the past. The analysis of cumulative effects of either Action Alternative evaluates the impact on sensitive species habitat from the existing condition within the terrestrial wildlife analysis area. Cumulative effects on the northern goshawk are similar to those described for the California spotted owl.

Alternative 3 – Direct and Indirect Effects of No Action

There would be no direct effects on northern goshawks or their habitat, as no activities would occur that would cause disturbance to nesting or foraging birds, nor any impacts to the existing habitat conditions.

Indirect effects of no action would be continued poor overall health of overstocked stands, not thinned under this alternative, slowing the progression of the habitat to the old growth stage, needed for successful goshawk occupancy and productivity. No work would be done to bring species mix and stocking more in line with historical conditions that could lessen the risk of stand-replacing events from insect, disease or wildfire.

There would be no action taken to maintain and restore aspen on the landscape. Thus potentially reducing habitat diversity for northern goshawks and their prey in the wildlife analysis area, due to loss of the aspen clones through succession (i.e., lack of stand recruitment and decadence of mature aspen).

There would be no direct effects on goshawks or their habitat, as no new temporary roads would be built that would cause disturbance to nesting or foraging goshawks, nor any new impacts to the existing habitat conditions. There would be no action taken to decommission roads, thus maintaining the current road density of approximately 2.3 miles/square mile. Roads would continue to fragment the terrestrial habitat decreasing suitability of the habitat through disturbance.

Cumulative Effects of No Action

The No Action Alternative for the Lakes Basin Project would not provide for the long-term protection of northern goshawk habitat from loss due to insect or disease outbreaks or wildfire. Total wildfire acres and high-intensity wildfire acres are anticipated to increase from current levels under this alternative (based on analysis conducted in SNFPA (USDA 2001)), which could lead to lower goshawk abundance from existing condition within the terrestrial wildlife analysis area. There would be no thinning that could enhance the growth of dominant and co-dominant (20-30 inches DBH) trees that may provide future habitat availability.

Determinations for Northern Goshawk

Action Alternatives – Alternatives 1 and 2

Implementation of either Action Alternative for the Lakes Basin Project may affect individuals, but is not likely to result in a trend toward Federal listing or loss of viability for the northern goshawk. This determination is based on the following:

1. Retention of all of existing foraging and 99% of nesting habitat on 14,665 acres of NFS lands within the terrestrial wildlife analysis area. This retention of nesting and foraging habitat would provide opportunities for future occupancy and population expansion;

2. Re-establishing healthy stocking levels of forested stands on up to 1,776 acres that would help to provide future suitable goshawk habitat.

Both Action Alternatives would have direct impacts to the current suitable nesting habitat, removing trees and breaking up the continuous canopy of trees, improving forested stands in the long term. Alternative 1 would directly affect more acres than Alternative 2 through mechanical treatment, therefore, more acres would benefit in the long term from healthier stocking levels of trees, and faster transition into suitable nesting habitat and more resilient to a stand-replacing event than Alternative 2. Foraging habitat would be enhanced through the opening up of the canopy and understory under both alternatives. Alternative 1 would make more of the suitable habitat more resilient to a stand-replacing event than Alternative 2.

It is acknowledged that implementation of either Action Alternative involves some risk to habitat and subsequent uncertainty with regards to goshawk activity. Based on the amount of suitable habitat affected and the expected habitat condition post treatment (improved forest health and resiliency), either Action Alternative provides less long-term risk to goshawks than the No Action Alternative.

No Action Alternative

Not implementing the Lakes Basin Project will not directly affect individual northern goshawks.

Alternative 3 is not without risk to northern goshawk habitat, as no action is taken to improve the overall health of forested stands, and leaves existing goshawk habitat vulnerable to large scale fragmentation as a result of insect, disease or wildfire.

Sierra Marten (*Martes caurina sierrae*)

Action Alternatives (Alternatives 1 and 2) Direct and Indirect Effects of Improving Forest Health and Forest Resiliency via Mechanical Treatments

Measurement Indicators 1 and 2: Acres of suitable habitat modified, lost or fragmented at various scales and Habitat components modified, lost or fragmented.

Effects of Mechanical Thinning, Grapple Pile

Much of the mechanical treatments would occur in the lower end of the marten's habitat range, where no marten have been detected. Approximately 1,217 acres of suitable habitat below 6,000’ would be treated. Above 6,000’, within occupied marten habitat, approximately 559 acres would be mechanically treated with tree removal and another 56 acres would be treated for brush removal. Treatments would vary from variable density thin, hazard tree removal, aspen stand improvement, and grapple piling. Hazard tree removal could remove important habitat components, large trees and snags, >25 inches DBH resulting in a reduction in habitat quality.

Overall, there would be a change of 976 acres of dense, 4D habitat to 4M (743) and 4P habitat (233 acres), within the wildlife analysis area. Of these 976 acres, 123 acres are within occupied marten habitat, where thinning could have a direct negative effect on marten use of the habitat as martens prefer areas with 65 -75% forest cover. However, VDT would create a heterogeneous mix of dense canopy and small openings, within the larger forest matrix that in the long term could provide higher quality suitable habitat, than the present condition which just provides the high canopy cover.

Many studies have shown that marten use large trees and snags as rest sites that are typically the largest available, often >35 inches DBH (North 2012). With either Action Alternative in general forest areas, the intent is to remove trees in the 12–18 inches DBH size class, with larger trees being removed to bring the species mix closer to the desired condition, retaining large shade-intolerant pines. The largest snags per acre should be maintained and hardwoods would be retained. Conifers retained possessing one or more of the following characteristics that are of value for wildlife: large limbs extending into the openings and meadows; mistletoe brooms

higher than 20’ from the ground; multiple tops; bole sweep; broken tops; heart rot; snags; etc. would decrease the risk of deleterious effects to old-forest related wildlife, like marten, in the long term (Dunk, 2005).

Within Lakes Basin designated recreation areas, hazard trees, of any diameter size, could be removed with either Action Alternative, and important structural habitat components would be lost. There are approximately 129 acres of recreation/hazard tree prescription within occupied marten habitat that could reduce habitat suitability due to the loss of large, decadent trees needed for denning and resting. Direct effects from mechanical treatment activities would be lessened through implementation of LOPs in occupied habitat.

Based on the Pesticide Fact Sheet prepared by Syracuse Environmental Research Associates, Inc. (2016), the application rate for either Sporax or Cellu-treat used by the Forest Service is considered non-toxic to vertebrate species. There are no known effects on martens from either Sporax or Cellu-treat applied to stumps.

Effects of Hand Thinning

Due to current lack of species presence in the north and eastern portions of the analysis area (mixed conifer, below 6,000’), there would be no known, direct or indirect effects of disturbance due to noise and increased human presence during chainsaw thinning activities to individuals. Hand thinning would negatively impact ground cover in suitable marten habitat, but overstory canopy cover would not be reduced and any large snags and downed logs would not be removed. If marten were to be detected prior to or during project work, appropriate LOPs would be implemented to protect potential denning.

Within the occupied habitat, 424 acres would be hand thinned, simplifying the understory and possibly causing martens to avoid these acres. Moriarty et al. (2016), showed that fuel treatments that simplify forest structure (removal of small diameter trees, downed logs, etc.) has negative effects on marten habitat use. Therefore, hand thinning in occupied marten habitat is expected to have a negative effect on habitat quality and use by martens.

Effects of Underburning

Follow up underburning within treatment units would simplify the lower forest canopy by burning off residual slash, small down logs and stumps. This has a direct negative effect on marten habitat use, but this prescribed burning would be done in unoccupied, marginal habitat and should provide for a healthier and more diverse understory in the long term, making it more suitable for occupancy in the future.

If implemented, the large, 2,404 acres, underburn only treatment would burn large blocks of habitat at a time, typically 50-200 acres. Martens need complex forests with complex structure on or near the ground and continuous cover, they prefer areas with 65 -75% forest cover. Underburning removes the structure from the ground up, opening up the forest canopy. Moriarty et al. (2016) recommended that to benefit martens, fuels treatments should be

planned outside of their habitat. Marten populations consistently decline, or become locally extirpated, in areas below a threshold of 65 -75% forest cover (Hargis et al. 1999).

Prescribed fire in this instance would not enhance marten habitat as they do most of their foraging along the ground and need the cover to rest and protect them from predators. Martens use snags, down logs and stumps for resting (North, 2012), and down logs and stumps are typically lost during underburning activities. As stated above, fuel treatments that simplify forest structure (removal of small diameter trees, downed logs, etc.) has negative effects on marten use. If all the acres in this large underburn are treated, it could impact an unknown number of territories on the 2,404 acres, rendering them (in part or in total), unsuitable post-treatment. Burning would take place over 5 or more years, therefore suitable habitat would not be lost all at once. However, this is high elevation habitat with a short growing season and it could take more than five years to get adequate cover for marten use. Since the number and locations of marten territories/denning areas are unknown, direct effects on the number of individual martens and/or territories cannot be quantified. If habitat becomes unsuitable due to underburn activities, individual martens may expand their territories, causing more competition for resources with martens outside of the treatment area.

There are constraints for underburning in the Lakes Basin area, and the total underburn only acres may likely be less than 2,404. The priority for underburning will be around the historic lodges, and then other areas within the WUI Defense Zone. Areas outside of WUI Defense Zone would be last priority. Again, with no knowledge of numbers of martens and locations of their territories, and an unknown number of acres that may be underburned, direct effects to individuals cannot be quantified.

Direct and Indirect Effects of Treatments to Improve Aspen Stands and Meadow Systems

Measurement Indicator 3: Changes in vegetation and aspen stand/ meadow characteristics.

Aspen stand and meadow improvement would have short-term direct negative impacts to marten habitat through the removal of large conifers, less than 30 inches DBH, that provide canopy cover and large structural components that could be used for denning or resting. However, aspen stands regenerate relatively quickly and canopy cover can be replaced quickly. Healthy aspen stands with a well-developed understory of vegetation, while not a preferred habitat, provide a diversity of foraging habitat for martens and safe travel corridors from predators.

Thinning conifers from meadow edges simplifies the forested stand, and as stated above, this has a negative effect on marten use of habitat. However, one of the purposes of the project is to allow meadows to reach their full potential in size and have healthy grass and herbaceous cover, improving habitat for many other wildlife species. Since there are only 42 acres of meadow enhancement within the 14,665 acre wildlife analysis area, there would be minimal effects to marten habitat.

Direct and Indirect Effects of Treatments to Improve Watershed Conditions

Measurement Indicator 4: Changes in road density.

Temporary road construction would occur outside of the occupied marten habitat and therefore would have no direct effect on martens. Actions, including road obliterations of non-system roads within suitable habitat and seeding with native vegetation, would have a positive effect on marten by facilitating vegetation recovery and lessening fragmentation of the habitat. Reducing open road densities to 2.0 miles/square mile, post-project would have a positive effect, reducing human activities that often reduce habitat suitability for many species, including martens.

Cumulative Effects

Cumulative effects on martens could occur with the incremental loss of the quantity and/or quality of habitat for this species. Overall, increases in urbanization, increases in recreational use of National Forest System lands, and the utilization of natural resources on state, private and Federal lands may contribute to habitat loss for this species.

Future activities on NFS lands include the Plumas-Eureka and Haskell Projects on the Plumas National Forest and the Yuba Project on the Tahoe National Forest, adjacent to the Lakes Basin Project, are expected to have similar short-term negative effects to suitable habitat, removal of medium sized trees, opening up the forest canopy, and similar long-term benefits of healthier forest and riparian habitats.

Road work on the Gold Lake Highway is expected to have no effect on martens and their habitat.

The Mills Peak Trail South project, as proposed, is located within occupied marten habitat and would add to the number of miles of trails (47) in the Lakes Basin area. These trails fragment the habitat and bring more human disturbance to marten in the area.

The Lakes Basin Project area, as well as the wildlife analysis areas, has areas open to woodcutting and Christmas tree cutting but amounts are not quantifiable. This area is heavily used by the public and these activities are expected to continue. Snags and down logs would continue to be removed, resulting in the cumulative loss of these habitat components across the landscape. Snags are recruited annually from live trees through natural processes at a rate that may sustain this loss within the terrestrial wildlife analysis area. Snag and log removal is most common along, or within a short distance from, open roads, therefore; obliteration of roads under either Action Alternative would reduce the area accessible for, and the impact of, woodcutting. The past and future effect of these actions has and would be to remove habitat structure used by wildlife.

As mentioned above, the entire project area is heavily used by the public, being a recreation area. Most of the recreation use within the wildlife analysis area consists of camping, fishing, hiking, horseback riding, hunting, mountain biking, pleasure driving, and wildlife watching. These uses are expected to continue. The true extent and effect of these activities on Sierra marten is not known.

Alternative 3 – Direct and Indirect Effects of No Action

There would be no direct effects on marten habitat, as no activities would occur that would cause disturbance or any impacts to the existing habitat conditions, especially in occupied habitat.

Indirect effects of no action would be continued poor overall health of overstocked stands of unoccupied mixed conifer habitat, not thinned under this alternative, slowing the progression of the habitat to the old growth stage, needed for successful marten occupancy and productivity. No work would be done to bring species mix and stocking more in line with historical conditions, where fire can play a role in habitat recovery instead of being stand replacing.

Within occupied marten habitat, the No Action Alternative would benefit marten and marten habitat, by keeping the understory, including down logs, brush, and stumps intact.

There would be no action taken to maintain and restore aspen and meadows on the landscape thus potentially reducing habitat diversity for martens and their prey in the wildlife analysis area, due to loss of these habitats over time through succession.

There would be no action taken to decommission non-system roads, thus maintaining the current fragmentation and disturbance patterns within marten habitat.

Cumulative Effects of No Action

The No Action Alternative for the Lakes Basin Project would not provide for the long-term protection of marten mixed conifer habitat from stand-replacing events such as insect and disease outbreaks or fire. Wildfire acres and high-intensity wildfire acres are anticipated to increase from current levels under this alternative (based on analysis conducted in SNFPA (USDA 2001)).

Within occupied habitat, the No Action Alternative would not contribute to cumulative effects on marten and their habitat.

Determinations for Sierra Marten

Action Alternatives – Alternatives 1 and 2

Implementing either Action Alternative for the Lakes Basin Project may affect individuals, but is not likely to result in a trend toward Federal listing or loss of viability for the Sierra marten. This determination is based on the following:

1. Most of the mechanical treatments occur outside of known, occupied habitat, would retain 95-96% of canopy cover in existing suitable denning habitat on 14,566 acres of NFS lands within the terrestrial wildlife analysis area and should improve the habitat over the long term.

2. Mechanical thinning, including hazard tree and brush removal would affect 559 acres and hand thinning would affect 424 acres of occupied habitat.

Fully implementing the Underburn Only treatment, along with all the other treatments, may affect individuals and potentially lead to a loss of marten population viability of the Sierra marten in the Lakes Basin area, but will not contribute to a Sierra Nevada trend toward Federal listing of the species. This determination is based on the following:

1. The current population status is unknown for martens in the Lakes Basin area, whether it is increasing, decreasing or stable.

2. There is no information on denning areas, so they cannot be protected during any project activities.

3. A large area of occupied habitat could become unsuitable due to the loss of understory, down logs and stumps.

4. The unknown cumulative effects of increasing, high use recreation, removal of important habitat components through hazard tree reduction, hand thinning and prescribed fire.

No Action Alternative

Not implementing the Lakes Basin Project will not affect individuals, and would have a more positive effect on occupied marten habitat than either Action Alternative, by keeping the current habitat components, important to marten occupancy, on the landscape.

Summary of Determinations for Terrestrial and Aquatic Species

Action Alternatives – Alternatives 1 and 2

Both of the Action Alternatives proposed in the Lakes Basin Project would protect, maintain or enhance habitat for most sensitive species through project design, specifically: the use of variable density thinning, spotted owl PACs and northern goshawk nest cores would not be treated, disturbance would be limited through implementation of the necessary Limited Operating Periods (LOPs), and riparian areas and meadows would be managed by designating RCAs and meeting BMPs during implementation. The Action Alternatives would not maintain or enhance habitat for marten. Impacts to NFS lands resulting from the Lakes Basin Project are expected to contribute to cumulative impacts on certain sensitive wildlife species.

The potential short-term effects of both of the action alternatives are anticipated to be outweighed by the long-term benefit of maintaining and enhancing habitat on the landscape by improving overall forest health and resiliency, especially in the mixed conifer habitat. Project activities will result in restoration of important wildlife habitat by improving aspen stands and meadows throughout the area, reducing road density, and promoting the development of stands with larger diameter trees. Additionally, the use of prescribed fire would be beneficial to many wildlife species by promoting forage and prey species habitat.

Table 57. Determinations of Effects on Threatened, Endangered, Proposed, and Sensitive Animal Species that Potentially Occur on the Plumas National Forest

Species	Alternative 1	Alternative 2	Alternative 3* (No Action)
INVERTEBRATES			
Western Bumble Bee (*Bombus occidentalis*)	MAI	MAI	WNA
AMPHIBIANS			
Sierra (Mountain) yellow-legged frog (*Rana sierra*)	MAILAA	MAILAA	WNA
SNYLF Designated Critical Habitat	MAINLA	MAINLA	WNA
Foothill yellow-legged frog (*Rana boylii*)	MAI	MAI	WNA
BIRDS			
California spotted owl (*Strix occiedentalis occidentalis*)	MAI	MAI	WNA
Northern goshawk (*Accipiter gentilis*)	MAI	MAI	WNA
Great Gray Owl	WNA	WNA	WNA
MAMMALS			
Pacific fisher (*Martes pennant pacifica*)	WNA	WNA	WNA
Sierra marten (*Martes caurina sierra*)	MAI**	MAI**	WNA
Pallid bat (*Antrozous pallidus*)	MAI	MAI	WNA
Townsend's big-eared bat (*Corynorhinus townsendii*)	MAI	MAI	WNA
Fringe-tailed Myotis	MAI	MAI	WNA

*__Determinations__: **T, E & P Species: WNA** = Will Not Affect, **MAINLA** = May Affect but Is Not Likely to Adversely Affect Individuals or their designated critical habitat, **MAILAA** = May Affect and Is Likely to Adversely Affect Individuals or their designated critical habitat.

FS Sensitive Species: WNA = Will Not Affect, **MAI** = May Affect Individuals, but is not likely to result in a trend toward Federal listing or loss of viability, **MAILRTFL** = May Affect Individuals, and is Likely to Result in a Trend toward Federal Listing or loss of viability.

**Either action alternative if all project activities are fully implemented could lead to a loss of viability of marten in the Lakes Basin area.

Hydrology and Soils

Existing conditions

Existing Soil Condition

Soils within the project treatment units vary with the occurrence of 14 individual soil types. The erosion hazard ratings of the soil types that are in the project treatment units range from low to high and compaction potential slightly to moderate. Soil textures vary within the treatment units including, but not limited to the following textures: loamy coarse sand, sandy loam, gravelly loamy sand, very gravelly sandy loam, very stony loamy sand, gravelly loamy fine sand, loamy sand, and gravelly or cobbly sandy loam (USDA 1988c).

Proposed treatment units were surveyed by conducting linear transects that roughly traversed the slope–a minimum of 60 points were sampled and additional physical attributes gathered at every fifth point. Transects may have spanned into other treatment units when existing soil conditions were homogeneous. Representative samples of all soil types and stand structure condition combinations were surveyed.

Soil indicator measures and existing soil conditions within the surveyed treatment units are included in the following table (Table 58).

Effective Soil Cover

Effective soil cover is necessary to prevent accelerated soil erosion. Soil cover ranges from 43 to 100 percent with a mean average of 88 percent and median of 94 percent within 76 treatment units surveyed. PNF LRMP standards and guidelines for effective ground cover vary by the soil erosion hazard rating (EHR) for the Lakes Basin Project (USDA 1988a). Based upon the predominate soil types within the treatment units and corresponding EHRs, ground cover shall be maintained at, or above, 60 percent soil cover. All treatment units surveyed are currently above 50 percent effective soil cover with the exception of unit 210 (43%).

Table 58. Soil indicator measures for treatment units within the Lakes Basin Project.

Measure	Existing Soil Condition	Objective or Standard	Effect
Indicator Measure 1: *Effective Soil Cover*	Ranges from 43 – 100%, mean of 88 percent	60%	Slight decrease but would stay above standard. Is expected to return to pre-project condition relatively quickly in all vegetation units due to natural forest processes. Where available, additional ground cover will be left in units that are below 60% to improve site conditions.
Indicator Measure 2: *Soil Compaction*	Ranges from 0-35%, mean of 3 percent	Not specific	Slight increase, but would be limited by using standard practices to avoid wet soils during operations, reusing existing skid and temporary roads and landings, including subsoiling them after use.
Indicator Measure 3: *Fine Organic Matter*	Ranges from 0 – 88%, mean of 30%	Maintain or improve existing percent organic matter	Slight decrease but would stay above standard and return to pre-project condition relatively quickly in all vegetation units due to natural forest processes. Some displacement may occur where equipment turns but would not be significant. Where available, additional organic matter will be left in units that are below the desired condition of 50% to improve site conditions.

Soil Compaction

The extent of detrimental soil compaction should not be of a size or pattern that would result in a significant change in production potential for the activity area and should not result in

common occurrences of overland flow and erosion within treated units (indicating that the infiltration and permeability capacity of the soil has been exceeded for the local climate).

Based on soil surveys, soil compaction was found to be mostly under 10 percent within 76 treatment units with the exception of the following units 110 (18%), 114 (35%), 118 (13%) 202 (15%), 203 (17%), and 210 (15%). The mean average for soil compaction is 3 percent and median of 0 percent within the 76 treatment units surveyed. The area of detrimentally compacted ground is primarily occupied by skid trails and other man-made features (e.g. roads, etc.).

Fine Organic Matter

Organic cover helps promote site productivity and prevent soil loss from erosion. Fine organic matter consists of plant litter, duff, and woody material less than three inches in diameter. The desired condition for fine organic matter is typically at least 50 percent, where less than 30 percent areal extent of fine organic matter represents a poor condition. However, based upon soil surveys within 76 treatment units, most units are well below 50 percent. Based upon soil cover and comments made during surveys, many of the units included rocky ground cover. Fine organic matter ranges from 0 to 88 percent with mean average of 30 percent and a median of 25 percent within the treatment units surveyed.

Existing Hydrologic Conditions and Water Quality

There are approximately 72 miles of stream channels in the analysis watersheds according to hydrology and wildlife field surveys conducted in 2014 and 2015 and assessment of the National Hydrologic Data (NHD) Geographic Information System (GIS) stream layer information. The main drainages include Frazier Creek and Gray Eagle Creek which flow into the Middle Fork of the Feather River. Within the watershed analysis area, there are 28 miles of perennial, 18.5 miles of intermittent and 26 miles of ephemeral streams for a total of 72.5 miles of streams. Of the 28 miles of perennial streams, approximately 7.5 miles are fish bearing (Frazier and Gray Eagle Creeks). The stream channels within the proposed mechanical treatment units were surveyed to verify flow regimes and subsequent Riparian Conservation Area (RCA) buffer designation. Buffer zone widths vary depending on channel characteristics, flow regime and the presence of fish and other aquatic attributes (Appendix C of the Lakes Basin Project Water and Soil Resource Effects Assessment (USDA 2018d)). There are 4 lakes and 19 ponds within the watershed analysis area. A few of the smaller ponds can be ephemeral during dry years. All of the larger ponds and lakes are permanent water. Additionally, there are approximately 2 springs/seeps and 7 wetland areas located in the watershed analysis area.

Based upon field surveys conducted in 2014 and 2015 along with the assessment of Motor Vehicle Use Map (MVUM) and aerial photo interpretation, there are approximately 43 miles of National Forest Service (NFS) system roads and 25 miles of other roads (e.g. non-system roads, private, county, etc.) within the project watershed analysis area, totaling 68 miles. Additionally, there are 47 miles of trails within the watershed analysis area (Table 59).

Table 59. Hydrologic and water quality indicator measures, including road treatments in the watershed analysis area.

Resource Indicator	Miles
System Roads	43
Other Roads*	25
Trails	47
New Temporary Road Construction	5
System Road Reconstruction and Maintenance	9
Non-system Road Obliteration	3

*These include roads on private lands and non-system roads on NFS lands within the watershed analysis area.

Road density is a measurement tool to assess the potential impacts caused by roads by calculating the number of miles of road per square mile of area (e.g. watershed). Table 60 is a general rating system of road density for an analysis area (USDA 1999). This table is meant to be used as an assessment tool to indicate low, moderate, or high number of roads present in an area as other site specific factors (e.g. roads within RCAs including crossings, etc.) are considered in other assessments (e.g. system and non-system road surveys) for the Lake Basin project. Existing road miles and densities within the analysis watersheds are shown in Table 61 under the Environmental Consequences, Alternative 1 section.

Table 60. Rating system of road density for an analysis area.

Rating	Road Density (mi/mi^2)
Low	Less than 1
Moderate	2-3
High	Greater than 3

Environmental Consequences

Alternative 1 – Proposed Action

Direct and Indirect Effects of Treatments to Improve Forest Health

Mechanical Thinning

Vegetation management through mechanical thinning in the uplands can potentially change the hydrologic regime in the area. Soil erosion could direct sedimentation into streams that could create short-term unsuitable water quality which could impact riparian habitat. Of all the actions proposed, mechanical thinning has the greatest risk of impacts to hydrology and soils. Mechanical thinning would cause associated disturbances from the re-use and creation of skid

trails, landings, and temporary roads. These ground disturbances would render harvested areas more susceptible to erosion and sediment mobilization. However, with appropriate implementation of standards and guidelines (USDA 1988a), BMPs (Appendix A of the Lakes Basin Project Water and Soil Resource Effects Assessment (USDA 2018d)), standard management requirements (Appendix D) and watershed mitigation measures (Appendix C of the Lakes Basin Project Water and Soil Resource Effects Assessment (USDA 2018d)), it is anticipated that there would be no disruption in flows and minimal short-term sedimentation into streams.

Effects of mechanical thinning on effective soil cover are well documented. Soil monitoring for the Herger-Feinstein Quincy Library Group (HFQLG) pilot project documented a statistically significant average decrease of 12 percent for effective soil cover in 2007 (USDA 2008). A similar average decrease was reported for a larger sample size in 2011 and only 1 of the 73 mechanical thinning units monitored had less than 50% soil cover post-treatment (for this unit, the lack of cover was attributed to duff consumption from follow-up prescribed burning) (USDA 2012a). Given the existing levels of soil cover currently in the planning units, soil cover standards are expected to be met and/or improved upon in all units. Effects to fine organic matter would be similar in mechanically thinned units. However, existing condition of organic matter in most units are below the desire condition of 50%. Additional organic matter will be left in units to improve upon site conditions.

Recent science on the effects of mechanical thinning on soil porosity and compaction show that soils can be compacted by machinery especially when soil moisture is high, but effects of compaction vary widely by soil type. Decreases in forest productivity has been shown to be primarily a problem with clay soils and actually increase in sandy soils (Powers et al. 2005). Compaction is not predicted to be of a size or pattern that would cause overland flow and erosion, because soil moisture tests are part of thinning contract administration and BMPs such as water bars would be installed on skid trails (Appendix A of the Lakes Basin Project Water and Soil Resource Effects Assessment (USDA 2018d)). Areas that see a lot of traffic and that do not have a sandy soil type will likely be compacted such as temporary roads, major skid trails and landings. Additional watershed mitigation measures would be implemented where necessary (Appendix C of the Lakes Basin Project Water and Soil Resource Effects Assessment (USDA 2018d)).

Direct and indirect detrimental effects of machine piling (i.e. grapple piling) are considered less likely when compared to mechanical thinning. Although still considered mechanical, these machines are mounted on tracks resulting in less ground pressure compacting soils. Also, no skid trails, temporary roads, and landings are needed for this type of treatment.

Grapple piling is proposed on approximately 139 acres and hand thinning with grapple piling is proposed on approximately 116 acres. Grapple piles would be subsequently burned. These operations will be allowed in the same outer RCA areas as mechanical thinning and on slightly steeper slopes. The equipment exclusion zones (Appendix C of the Lakes Basin Project Water and Soil Resource Effects Assessment (USDA 2018d)) will adequately protect water quality and

ensure that Riparian Conservation Objectives are met (Appendix D of the Lakes Basin Project Water and Soil Resource Effects Assessment (USDA 2018d)).

This project proposes to treat the excessive amounts of down wood present to reduce fuel loading while meeting the general forest standard of 10-15 tons per acre (See Wildlife Report for further discussion). Reductions in large woody material would cause minor, localized changes to soil microhabitat. Removal of canopy cover may result in increased temperatures at the forest floor as well as reduced moisture content of forest floor materials (Erickson et al. 1985); however, more precipitation would pass through the canopy layer and be available for groundwater recharge.

RCA Treatments

Perennial (fish bearing and non-fish bearing), intermittent, and ephemeral streams, special aquatic features (reservoirs, wetlands, fens, and springs) and other hydrologic or topographic depressions without a defined channel are managed as Riparian Conservation Areas (RCAs) (USDA 2004). All RCAs within the project area would be managed consistent with the SNFPA ROD's standard and guidelines and Riparian Conservation Objectives (RCOs) (Appendix D of the Lakes Basin Project Water and Soil Resource Effects Assessment (USDA 2018d)). All applicable PNF LRMP (USDA 1988a) standards and guidelines (S&Gs), Best Management Practices (BMPs) (Appendix A of the Lakes Basin Project Water and Soil Resource Effects Assessment (USDA 2018d)), Project Standard Management Requirements (SMRs) (Appendix D) and design elements (Table 7), and Watershed Mitigation Measures (Appendix C of the Lakes Basin Project Water and Soil Resource Effects Assessment (USDA 2018d)) would be implemented with all land disturbing activities proposed in either Alternative 1 or Alternative 2.

Mechanical thinning would be allowed in the outer portions of the RCAs in both Action Alternatives (Alternative 1 and 2) with restrictions identified in Appendix C of the Lakes Basin Project Water and Soil Resource Effects Assessment (USDA 2018d). The primary benefit of treatment within the RCAs is reducing fuel loads and thereby potentially decreasing the risk of high- severity wildfires occurring in these areas. Proposed thinning within RCAs would also release the existing conifers to grow into larger diameter trees and thus be retained for future natural recruitment of LWD into the stream channel. Thinning within the RCAs would initially reduce the interception of precipitation, but as canopies of residual trees stretch out, more precipitation will be intercepted. This is a benefit to aquatics and beneficial uses of the water by potentially reducing runoff, increasing ground water retention, and providing cold water later into the summer and fall seasons. Wet meadows and riparian vegetation would be maintained within the RCAs. Although there are added risks of detrimental effects when ground disturbing activities are conducted nearer aquatic features, the risks are considered minimal.

The Riparian Conservation Objectives will be met (Appendix D of the Lakes Basin Project Water and Soil Resource Effects Assessment (USDA 2018d)), based on:

1. Soil indicator measures will meet standards and/or move towards desired conditions after implementation.

2. Where applicable, equipment exclusion zones still provide a relatively undisturbed buffer.
3. BMPs (Appendix A of the Lakes Basin Project Water and Soil Resource Effects Assessment (USDA 2018d)) and project protection measures (Watershed Mitigation Measures, Appendix C of the Lakes Basin Project Water and Soil Resource Effects Assessment (USDA 2018d)) are in place to minimize erosion.

Traffic associated with delivering equipment and personnel and hauling wood products out of the forest poses a risk to water quality by causing damage to the road surfaces near drainages. Protection measures and BMPs are in place to maintain roads and avoid excessively wet periods. In addition, problem spots on the road system will be identified prior to project implementation and actions would be planned to fix these problems.

Hand Thinning, Pile Burning, and Underburning

Hand thinning under either of the Action Alternatives (Alternative 1 or 2) would trample vegetation causing short-term, direct disturbance to area being treated. Indirect effects include: short-term loss of or disturbance to riparian vegetation and changes in the microclimate (reduced humidity, and increased air temperatures) due to the hand thinning and burning activities, and possible increased sedimentation to the stream channel due to increased overland flows from the proposed project. However, these effects are temporal and the detrimental direct and indirect effects related to hand thinning, pile burning and underburning are less than any mechanical treatment option.

Hand thinning, pile burning and underburning activities are expected to decrease soil cover, but specifications will be included in contracts or direction to crews to ensure standards are met including following applicable BMPs. Groundcover standards are generally always met with hand treatment because the forest floor is substantially less disturbed relative to mechanical thinning and because hand piling limits the amount of slash that can be cost-effectively removed from the treated units.

Pile burning will decrease soil cover to zero under the pile and there is a risk of nutrient pollution in ash moving off site to water bodies. A recent study conducted in the Tahoe Basin did show that although the soil is impacted directly under the pile the small areal extent of piles on the landscape ensured that both runoff due to water repellency and nutrient did not move downhill more than a few meters (Hubbert et. al. 2015). Piles are not allowed immediately adjacent to streams (Appendix C of the Lakes Basin Project Water and Soil Resource Effects Assessment (USDA 2018d)) to ensure that direct impacts to water quality are minimized.

Backing fires and underburning in the uplands can increase sediment production in streams if buffer strips are not maintained (Chamberlain et al. 1991, USDI 2001). Annual water yields can be significantly increased after fire due to the reduction of transpiring vegetation (Agee 1993, USDI 2001). Underburn treatments are designed and timed to burn at low severity leaving plenty of ground cover to meet all the soil standards. Within the underburn only unit (2,404 acres), if all acres were underburned the level of impact to water and soil resources would be elevated. However, because of the terrain and the patchy nature of the fuels over many of the acres, up to

half or more of the underburn only area may not be burned. As mentioned above, the priority for underburning is around the historic lodges, and is expected that impacts to water and soil resources would be negligible.

Accessing the work areas in fall, winter, and spring on wet native surface roads is proving to be more of an impact from these activities. Either wet weather restrictions will be placed in the contracts where needed to protect the road system from undue damage, or roads will need to be improved with surfacing.

Project BMPs (Appendix A of the Lakes Basin Project Water and Soil Resource Effects Assessment (USDA 2018d)), standard management requirements (Appendix D) and watershed protection measures (Appendix C of the Lakes Basin Project Water and Soil Resource Effects Assessment (USDA 2018d)) are included to ensure that any fire lines constructed by hand or mechanically will have adequate drainage structures installed and they will be rehabilitated, blocked, and disguised after use to discourage them from becoming non-system motorized trails after projects.

Application of Borate Formulations

The Action Alternatives (Alternatives 1 and 2) would have either EPA approved borate compound formulation Sporax® or Cellu-Treat® applied to conifer stumps greater than 14 inches in general forest units within one day of cutting, to prevent the introduction and spread of Annosus root disease (*Heterobasidion annosum* (*Fomes annosus*)). The average application rate for these borate compounds in thinning areas would be less than 1 pound per acre (approximately 0.5 pounds per acre) with a range of 0.1 lbs/acre to 1.1 lbs/acre. Information describing the potential effects on soil and water resources associated with Sporax and Cellu-Treat are contained in the 2006 and 2016 risk assessment completed by Syracuse Environmental Research Associates, Inc. (SERA 2006; SERA 2016). This document is incorporated by reference into this effects analysis for the Lakes Basin Project.

The agent of toxicological concern in both Sporax and Cellu-Treat is boron, primarily in the form of boric acid. Borates are naturally occurring compounds that are converted predominately to boric acid. The use of Sporax and Cellu-treat are not expected to substantially contribute to concentration of boron in water or soil beyond those that are associated with the normal occurrence of boron in the environment (SERA 2006; SERA 2016).

In the ecological risk of the 2016 SERA Risk Assessment, application rates of boron to most exposure assessments in surface water concentrations were found to be directly proportional to the application rate in units of lb/acre. It was found that the application rates between boron and Cellu-treat were almost identical. In water, the boron compounds transform rapidly into borates and no further transformation occurs. These compounds may be transported by percolation, sediment, or runoff from soil to water surrounding treated stumps. Additionally, the compounds are adsorbed in soils to varying degrees, depending on several factors, including soil type and water pH (SERA 2006; SERA 2016). Additionally, application of borate was found to not substantially increase boron in the soil. Borates are effective fungicides and some non-target soil

microorganisms could be affected by exposure to boron in soil. However, there is no basis that borates would cause adverse effects to microorganisms through soil exposure (SERA 2006; SERA 2016).

Based upon application method and rates proposed for the Lakes Basin Project, widespread exposure to soil microorganisms are not likely. No direct effects on soil productivity are predicted from the proposed fungicide treatments with the use of Sporax or Cellu-Treat. The potential for adverse effects of fungicide residues in soil and water would be minimized or eliminated by incorporating the proposed design criteria and applying BMPs for herbicide application. Design criteria include carefully planned fungicide use according to the label and other relevant requirements, spill contingency plans, proper disposal of containers and cleaning equipment, adequate buffer strips, spray drift control, and restricted use of fungicide near water bodies with sensitive amphibian species (see Wildlife Report for further discussion).

Water Quality BMP Effectiveness

Previous results of BMP monitoring on the Plumas National Forest demonstrate that these water quality protection measures are effective at preventing erosion and sedimentation from the aforementioned land management activities (USDA 2012c). The 2012 report summarized results from over 320 BMP evaluations (skid trails, landings, streamside zone protection, prescribed burning, and road drainage) completed between 2007 and 2012. BMPs were rated as effective for 91 percent of these evaluations. For the BMPs rated as non-effective, none of the sites evaluated exhibited significant and long-term impacts to water quality and beneficial uses.

If road BMP evaluations are not considered, BMPs were rated as effective for 96 percent of the 222 evaluations. The BMP deficiencies observed were predominantly due to legacy effects associated with the original design or location of system haul roads. In-sloped road designs concentrate road runoff in the inside ditch and the legacy design roads—most constructed prior to the Clean Water Act amendment of 1972—often did not include sufficient frequency of drainage structures to disperse road runoff and prevent the ditches from delivering sediment to streams at road crossings. Road treatments are proposed to address priority legacy design issues where insufficient drainage occurs.

Application of BMPs and project protection measures such as streamside equipment exclusion zones would effectively protect streams from excessive project generated sediment, assuring that direct and indirect effects of the project do not adversely affect beneficial uses of water.

Direct and Indirect Effects of Treatments to Improve Aspen Stands and Meadow Systems

There are several aspen stands and meadows within the project area that are currently being encroached upon by conifers. Aspen stands in the Sierra Nevada are usually a minor, but important, habitat component with high plant and animal diversity, surrounded by drier conifer forests (Sheppard et. al. 2006). Overtime, without fire or other disturbance, conifers encroach on the aspen and many of the plant species associated with aspen. Many meadows also support a diversity of plants and wildlife and are experiencing similar conifer encroachment as the aspen

stands and it is equally important to improve upon these areas through the Action Alternatives (Alternative 1 and 2).

Mechanical and hand thinning would be allowed in the outer portions of the RCAs in both Action Alternatives (Alternative 1 and 2) with restrictions identified in Appendix C of the Lakes Basin Project Water and Soil Resource Effects Assessment (USDA 2018d) with the intention of achieving the following results in aspen and meadow treatment units:

1. The removal of all conifers <30 inch DBH unless they provide bank stability to a stream channel, enhances approximately 71 acres of aspen habitat. Select tree species (including but not limited to pine species, Douglas-fir, and red fir) and those exhibiting old tree characteristics (downward or outward sweeping branches and/or rounding or flat crown apex) or desirable wildlife characteristics also would be preferred for retention.
2. This release treatment would be ecologically important especially since aspen in the west are considered second only to riparian areas in terms of biodiversity (Sheppard et. al. 2006)
3. Enhances approximately 42 acres of meadow habitat by removing conifer encroachment, allowing meadow vegetation to become more prevalent, improving meadow habitat and function. Additional meadows that are identified during field operations within treatment units may be treated similarly upon specialist review and approval.

See RCA Treatments section above.

Direct and Indirect Effects of Treatments to Improve Watershed Conditions

The actions proposed for improving watershed conditions involve reducing the impact of the transportation system on water and soil quality. The primary actions are system road improvements and non-system road and trail obliterations (Table 59). Additionally, 1.2 miles of existing non-system roads would be brought into the system in order to maintain access to system trails and dispersed camping sites.

As described above, road density is a measurement tool to assess the potential impacts caused by roads by calculating the number of miles of road per square mile of an area (e.g. watershed). Table 60 is a general rating system of road density for an analysis area. This table is meant to be used as an assessment tool to indicate low, moderate, or high number of roads present in an area as other site specific factors (e.g. roads within RCAs including crossings, etc.) are considered in other assessments (e.g. system and non-system road surveys) for the Lake Basin Project.

Road densities within the analysis watersheds are low (0.32 mi/mi2) to high (7.89 mi/mi2) (Table 61). Road densities within East Smith (0.32 mi/mi2) and Upper Gray Eagle (0.72 mi/mi2) analysis watersheds are low due to the fact that there are very few roads in the Recreation Area and the Semi-Primitive areas. The Middle (6.30 mi/mi2), Fork (7.89 mi/mi2), Lower Smith (3.28 mi/mi2) and Feather (5.03 mi/mi2) analysis watersheds have high road densities due to the amount of private lands, specifically roads associated with development within the watersheds.

Table 61. Road miles and densities in the analysis watersheds in the Lakes Basin Project.

Watershed	Watershed Area (acres)	Watershed Area (mi^2)	Roads (mi)	Road Density (mi/mi^2)		Non-system Road Oblits (mi)	Road Density (mi/mi^2)
Lower Smith	947	1.52	4.97	3.28		0	3.28
Lower Gray Eagle	2757	4.41	12.19	2.76		0.54	2.64
East Smith	1106	1.77	0.57	0.32		0	0.32
Mohawk	2044	3.27	4.9	1.50		0.31	1.40
Bear Wallow	862	1.38	4.09	2.97		0	2.97
Lower Frazier	1842	2.95	6.02	2.04		0	2.04
Upper Gray Eagle	3381	5.41	3.92	0.72		0	0.72
Upper Frazier	4640	7.42	15.33	2.06		2.22	1.77
Middle	867	1.39	8.75	6.30		0	6.30
Fork	474	0.76	5.98	7.89		0	7.89
Feather	614	0.98	4.94	5.03		0.57	4.45
TOTAL	**19537**	**31.26**	**71.66**	**N/A**		**3.64**	**N/A**

There are existing short spur roads, totaling 3.6 miles, that are causing resource damage (Appendix B Figure 17). These roads would be obliterated which may entail culvert removal (where present), reconstructing stream channels, sub-soiling of the roadbed, fully or partially re-contouring the road to match the hillslope, installing barriers such as boulders and/or gates to discourage vehicle traffic, and/or seeding and mulching the affected area. Road obliteration would promote vegetative recovery, which can decrease compaction, increase infiltration into the roadbed, and increase soil stability and limit concentrated flow as well as surface erosion. Over time, obliterated roads would produce less sediment and surface runoff to adjacent watercourses. Re-contouring of hillslopes significantly reduced soil compaction, surface runoff, and sediment production compared to sub-soiling or cover cropping alone (Kolka and Smidt 2004).

There are 47 miles of trails in the project area and any new temporary roads could become user trails. Therefore, obliteration of any new temporary roads would be important to return the areas back to the pre-project condition. Additionally, the 1.2 miles of existing non-system roads that is proposed to be brought into the system in order to maintain access to system trails and dispersed camping sites would improve watershed conditions as it would allow for better maintenance to occur on these roads.

Road treatments would consist of measures to improve road drainage, reduce erosion caused by concentrated road runoff, and reduce sedimentation from roads into the stream network. The road treatments may include reshaping the roadbed so that runoff is less concentrated and/or installing rolling dips to disconnect the inside ditch from stream crossings or prevent water from diverting down the road in the event of culvert plugging. Some sections of roads in RCAs may be

reshaped and/or surfaced with aggregate to decrease erosion, and rip-rap aprons may be installed on the fill slope to protect the road prism from erosion. Armored low water crossings may also be installed where ephemeral drainages are now crossing the native road surface. Short-term increases in sediment mobilization during road maintenance and reconstruction would be minimized by BMPs and would be offset by long-term improvements to water quality as a result of amelioration of hydrologically connected road segments.

Cumulative Effects

The Lakes Basin Project percent Equivalent Roaded Acre (ERA) values for the analysis watersheds would remain well below the 12 percent Threshold of Concern (TOC) after implementation of the proposed alternatives. Table 62 shows a comparison of percent ERA values for all alternatives. The ERA values vary across the analysis watersheds due in part to road densities, past management activities including timber, and current livestock grazing. There are also 3.6 miles of road obliteration and other work that will offset some of the possible cumulative effects. Roads have repeatedly been shown to be if not the most significant, the most persistent contributor to cumulative watershed effects, so reducing the road mileage provides for meaningful and lasting recovery (Goode et al. 2012).

Table 62. Percent Equivalent Roaded Acre (ERA) values of 12 percent Threshold of Concern (TOC) for Lakes Basin Project analysis watersheds

			Percent ERA of 12% TOC		
Watershed	**Acres**		**Alt 3**	**Alt.1**	**Alt. 2**
Lower Smith	947		4.4	7.6	7.6
Lower Gray Eagle	2757		2.9	7.6	5.3
East Smith	1106		0.3	1.8	1.8
Mohawk	2044		1.7	6.8	6.8
Bear Wallow	862		4.1	6.2	6.2
Lower Frazier	1842		2.0	4.1	3.7
Upper Gray Eagle	3381		1.2	4.1	4.1
Upper Frazier	4640		2.3	4.5	4.5
Middle	867		3.1	5.1	5.1
Fork	474		3.8	7.1	7.1
Feather	614		2.8	8.3	8.3

Proposed mechanical treatments are generally expected to reduce effective soil cover, fine organic matter, and large woody debris in the short term, though compliance with the PNF LRMP standards would still be achieved. In the event of a wildfire in the project area, the proposed actions would decrease the likelihood of the Lakes Basin Project treatment units from experiencing high soil burn severity capable of adversely affecting hydrologic function and soil productivity. The areal extent of soil compaction would increase after implementation; data from the HFQLG soil monitoring study suggest that each harvest entry into an area will add some incremental compaction (USDA 2008). The expected extent of detrimental soil compaction for either action alternative would not be of a size or pattern that would result in a significant change in production potential for the activity area.

Alternative 2 – Spotted Owl Habitat Management Alternative

Direct and Indirect Effects of Treatments to Improve Forest Health

A detailed description of Alternative 2 is found in Proposed Action and Alternatives section.

Information in Table 2 is focused on the comparison of each alternative by treatment type. The following discussion is focused on the changes from Alternative 1 to Alternative 2.

Mechanical Thinning

Alternative 2 proposes a reduction of mechanical thinning by 558 acres, an increase of hand thin/hand pile by 326 acres, and 142 acres of "No Treatment", and reduction of temporary roads over Alternative 1. All other proposed actions with Alternative 1 will remain the same. Mechanical thinning would still be allowed in the outer portions of the RCAs in both Action Alternatives (Alternative 1 and 2) with restrictions identified in Appendix C of the Lakes Basin Project Water and Soil Resource Effects Assessment (USDA 2018d). As discussed under Alternative 1, applicable PNF LRMP (USDA 1988a) standards and guidelines (S&Gs), Best Management Practices (BMPs) (Appendix A of the Lakes Basin Project Water and Soil Resource Effects Assessment (USDA 2018d)), Project Standard Management Requirements (SMRs) (Appendix D), and Watershed Mitigation Measures (Appendix C of the Lakes Basin Project Water and Soil Resource Effects Assessment (USDA 2018d)) would be implemented with all land disturbing activities proposed in either Alternative 1 or Alternative 2.

The Riparian Conservation Objectives will still be met under Alternative 2 based upon the same factors as mentioned above under Alternative 1 (Appendix D of the Lakes Basin Project Water and Soil Resource Effects Assessment (USDA 2018d)).

RCA Treatments

Mechanical and hand thinning would be allowed in the outer portions of the RCAs in both Action Alternatives (Alternative 1 and 2) with restrictions identified in Appendix C of the Lakes Basin Project Water and Soil Resource Effects Assessment (USDA 2018d).

Hand Thinning, Pile Burning, and Underburning

Hand thinning, pile burning and underburning would be included with both Action Alternatives (Alternative 1 and 2). However, due to the increase of hand thinning and hand piling, more hand piling will occur with Alternative 2 over Alternative 1. This increase of 326 acres is not expected to be detrimental based upon the appropriate implementation of BMPs (Appendix A of the Lakes Basin Project Water and Soil Resource Effects Assessment (USDA 2018d)), standard management requirements (Appendix D) and watershed mitigation measures (Appendix C of the Lakes Basin Project Water and Soil Resource Effects Assessment (USDA 2018d)).

Application of Borate Formulations

Alternative 2 would have either EPA approved borate compound formulation Sporax® or Cellu-Treat® applied to conifer stumps at the same specification as mentioned under Alternative 1, but would have 588 less acres treated. As mentioned under Alternative 1, the potential for adverse

effects of fungicide residues in soil and water would be minimized or eliminated by incorporating the proposed design criteria and applying BMPs for herbicide application. Design criteria include carefully planned fungicide use according to the label and other relevant requirements, spill contingency plans, proper disposal of containers and cleaning equipment, adequate buffer strips, spray drift control, and restricted use of fungicide near water bodies with sensitive amphibian species (see Wildlife Report for further discussion).

Direct and Indirect Effects of Treatments to Improve Aspen Stands and Meadow Systems

All aspen and meadow treatment is expected to remain the same as in Alternative 1. See RCA Treatments discussion above under Alternative 1 on treatment of Aspen and Meadows as it relates to water and soil resources effects.

Direct and Indirect Effects of Treatments to Improve Watershed Conditions

The actions proposed for improving watershed conditions under Alternative 1 would remain the same with Alternative 2. This actions include system road improvements and non-system road and trail obliterations (Table 59).

Road densities within the analysis watersheds would remain the same as addressed under the above Alternative 1 discussion.

Cumulative Effects

The Lakes Basin Project percent Equivalent Roaded Acre (ERA) values for the analysis watersheds would remain well below the 12 percent Threshold of Concern (TOC) after implementation of all alternatives (Table 62). However, Lower Gray Eagle and Lower Frazier analysis watershed percent ERA values do decrease from 7.6% to 5.3% and 4.1% to 3.7%, respectively. Based upon the reduction of mechanical treatment, Alternative 2 is expected to have less of an impact to the resources of water and soils over Alternative 1.

Alternative 3 – No-Action Alternative

Direct and Indirect Effects of Improving Forest Health and Forest Resiliency

This alternative serves as a baseline for comparison among the alternatives, and is required by the implementing regulations of the National Environmental Policy Act (NEPA). This alternative takes no action at this time to implement the 1988 Plumas National Forest Land and Resource Management Plan (commonly referred to as the “Forest Plan”), as amended by the 2004 SNFPA final supplemental EIS Record of Decision. Current, on-going activities such as routine road maintenance and reconstruction, fire suppression and recreation would still occur in this area. However, treatments designed to reduce hazardous fuels, improve forest health, promote old forest ecosystems and associated species, support the local economy or reduce the impacts of roads would not occur. Since forest ecosystems are not static, they would still continue to change as a result of naturally occurring dynamic forces such as forest succession and wildfires. The current existing condition in mixed conifer stands of high fuel loading, diseased and overstocked stands and road impacts would not be addressed under the No-Action Alternative.

There would be no actions taken to improve the health and vigor of aspen stands, or to keep wet meadows from drying out and converting to forest stands.

Under the No-Action alternative, effective soil cover in the form of fine organic matter and large woody debris can be expected to increase as organic materials accumulate on the forest floor; consequently, erosion potential is currently very low and would continue to be so in the absence of a high severity fire.

The extent and degree of soil compaction is expected to decline slowly over time. This process may take several decades in forested environments (Grigal 2000). Root penetration, extension, and decay, along with the burrowing action of soil dwelling animals would contribute to an increase in soil porosity and decrease compaction.

Potential indirect effects relate to the long-term effects on stand structure and health, riparian area health and the increased possibility of large, stand-replacing wildfire due to implementing the No-Action Alternative. Overstocked stands would not be treated, keeping them more susceptible to drought and insect outbreaks. The effects of a large stand-replacing wildfire are speculative, but a worst case situation of a high-intensity, wind driven fire could result in the direct alteration of riparian zones with potential increases in soil erosion above normal levels and reduced soil productivity. Additionally, debris flows, sheet flow, and channel erosion are all more likely after severe wildfire removes organic ground cover and reduces the soils ability to absorb water into the sub-surface (Moody and Martin 2009; Swanson 1981).

Under the No-Action alternative, ERA values would slowly decline to a baseline level over time. Surface, ladder, and crown fuels would not be treated on upslope areas or in RCAs. A future severe wildfire could greatly increase ERA values within and across watersheds. The use of Borax would no longer be utilized under this alternative. As a result, no direct, indirect and/or cumulative effects are expected from this type of treatment.

Direct, Indirect, and Cumulative Effects of Improving Watershed Conditions

Road drainage improvements and obliteration activities would not occur under Alternative 3, so watershed benefits and reductions in ERA values due to road obliterations would not be realized. Deferred maintenance and reconstruction issues of the road system would continue to pose risks to water quality. Non-system roads would remain un-treated, although driving on these routes is prohibited under the Forest's 2010 decision for Subpart B of the federal 2005 Travel Management Rule (USDA 2010b).

Botany

Existing conditions

There are two rare vascular plant species, moonwort (*Botrychium* species) and Kellogg's Lewisia (*Lewisia kelloggii* ssp. *kelloggii*), known to occur within the project area and within 100 feet of treatment areas.

The four occurrences of moonworts cover approximately 0.1 acres and include an estimated 26 individual plants (AMSET 2014). They are all located in unit 1100, in the Graeagle Creek drainage in LBRA. Unit 1100 is proposed for underburn only treatment. No other treatment is proposed for this unit.

Environmental Consequences

The following sections provide a discussion of the direct, indirect and cumulative effects of each alternative to individual rare plant species. Rare plant species known to occur in or within 100 feet of proposed treatment areas that may be directly or indirectly affected by the proposed project are discussed in detail in this document.

Table 63. Acres of rare plant sites within 100 feet of treatment units displayed by alternative.

Species	Alternative 1		Alternative 2		Alternative 3 (No Action)	
	In Treatment Units	In Trans System	In Treatment Units	In Trans System	In Treatment Units	In Trans System
***Botrychium* species**	0.1	0	0.1	0	0	0
Lewisia kelloggii* ssp. *kelloggii	7	0	7	0	0	0
Total	7.1	0	7.1	0	0	0

Table 64. Number of rare plant sites within 100 feet of treatment units displayed by alternative.

Species	Alternative 1		Alternative 2		Alternative 3 (No Action)	
	In Treatment Units	In Trans System	In Treatment Units	In Trans System	In Treatment Units	In Trans System
***Botrychium* species**	4	0	4	0	0	0
Lewisia kelloggii* ssp. *kelloggii	1	0	1	0	0	0
Total	5	0	5	0	0	0

Botrychium species (sensitive moonworts)

There are four known occurrences of Botrychium species in the analysis area. Although it is certain that these are one of the sensitive species a final determination has not been made. These individuals are either the Mingan Moonwort (B. minganense) or the Mountain Moonwort (B. montanum). These occurrences will be protected as a control area that is flagged and avoided according to the interim management prescription. All four of these occurrences are in areas proposed for underburn only treatments. Removal of trees is not proposed in these areas. They will be flagged and avoided by mechanical treatment and hand treatment. During underburn activities fire will be allowed to creep into occurrences from adjacent terrain if the fuel loading permits but no ignitions will be done within the occurrences.

Direct and Indirect Effects of Treatments to Improve Forest Health, Aspen Stands and Meadow Systems

There will be no direct affects to the four occurrences of moonworts in the analysis area. A control area that includes the site plus a buffer of approximately 50-foot would be established and no activities would take place within that area. If any tree greater than 100 feet tall is removed from the immediate area surrounding the control area directional falling would be required. That tree would be felled in the opposite direction of the control area.

There may be indirect effects to the moonworts. Moonworts are dependent on their fungal partners and any disturbance that disrupts that relationship is likely to be detrimental. These moonwort species have not been found in open canopy forests. It is possible that removal of canopy cover near moonwort plants could allow excessive light and have a negative effect on the population. However, that potential negative effect is unlikely in this project because the nearest area of proposed tree removal is approximately 143 feet from any moonwort occurrence. That distance may be increased during implementation but it will not be decreased.

Changes in hydrology (the direction, volume, or timing of water flow) would likely be detrimental. On PNF springs are managed as special aquatic features (USDA 2004b). The springs that provide habitat for these occurrences are special aquatic features that will be managed to maintain their hydrologic function (USDA 2004b). They will not be developed for use as a source of water for project activities. The proposed action does not include any changes to the hydrologic conditions that create habitat for these plants. It is unlikely that there would be changes in the hydrologic function.

Indirect effects are not likely to be significantly detrimental for the following reasons: 1.) The hydrology would not be altered, 2.) the ground would not be disturbed within approximately 50 feet from the plants, and 3.) the canopy would not be altered within approximately 50 feet from plants.

Direct and Indirect Effects of Treatments to Improve Watershed Conditions

There would be no moonwort sites affected by transportation improvements under Alternative 1. The sites of proposed road work have been surveyed by botanists and no moonworts or other sensitive plant species were found.

Cumulative Effects

Previous activities in the area may have affected the moonworts. The LBRA is well used by hikers and mountain bikers. It is unlikely that hikers or bikers have affected these plants because Forest Service system trails do not enter the moonwort sites. These trails are not currently affecting the flow of water into the sites. Historic removal of large conifers likely contributed to altering the makeup of the plant community by creating openings in the canopy that promote growth of shrubs. Historic logging may have disturbed the soil enough to have a detrimental effect on the moonworts' fungal partners.

It is possible that fire exclusion over the past 100 years has led to unnatural levels of fuel accumulation. These conditions may have led to extreme fire behavior with severe heat and abnormally long residence time. One or more stand-replacing fires may have occurred and killed some moonwort plants. A large disturbance event such as severe fire may have significantly altered the plant community. A significant change in the plant community may have had an effect on the flow of water available for the moonworts and the fungal partners they rely on. These changes may have affected the growth and reproduction of the fungi. The resulting indirect effects to the moonworts are unknown, but it can be concluded that historic management of the forest has had an effect on the plant community in the analysis area.

In addition to the proposed activities other future foreseeable projects include Mills Peak Trail South, Gold Lake Highway Improvement, Yuba Project, Gold Lake 4 x 4 Campground Pit Toilet Replacement, ongoing firewood cutting, and Christmas tree cutting. The Mills Peak Trail South, Gold Lake Highway Improvement, Gold Lake 4 x 4 Campground Pit Toilet Replacement, and Yuba projects are all more than 1.5 miles from, and are in different watersheds than the moonwort occurrences. It is highly unlikely that these projects would affect the moonwort occurrences. Firewood and Christmas tree cutting is not permitted in the LBRA where these sites are located.

Alternative 2 – Spotted Owl Habitat Management Alternative

Direct and Indirect Effects of Treatments to Improve Forest Health, Aspen Stands and Meadow Systems

The indirect and direct effects of Alternative 2 on the sensitive moonwort occurrences would be identical to those of Alternative 1. The area where these occurrences are located would receive the same treatment under both alternatives.

Direct and Indirect Effects of Treatments to Improve Watershed Conditions

There would be no moonwort sites affected by transportation improvements under Alternative 2. The locations of these proposed transportation system activities have been surveyed and no moonworts were found.

Cumulative Effects

The cumulative effects of Alternative 2 on the sensitive moonwort occurrences would be identical to those of Alternative 1. The area where these occurrences are located would receive the same treatment under both alternatives.

Alternative 3 – No-Action Alternative

Direct and Indirect Effects of No Action to Improve Forest Health, Aspen Stands and Meadow Systems

There would be no moonwort plants directly affected by Alternative 3, because there would be no action taken at this time.

Although there no direct effects from project activities, there are possible negative indirect effects from no action. Indirect effects from the No-action Alternative would be those associated with the current and future threat of wild fire.

Continued accumulation of live and dead fuel increases the risk of high-intensity wildfire. A high-intensity wildfire may kill plants and their necessary fungal partner. A stand-replacing wildfire would leave the area with no canopy cover and these plants cannot survive in full sun. Wildfire is also likely to leave the area at greater vulnerability to noxious weed invasion. It is impossible to determine where, when and how a wildfire may enter an area, making any calculations of effects of wildfire to Sensitive plant populations unpredictable. The effects of fire suppression can have larger impacts to Sensitive plants and their habitat than the wildfire itself and actual effects often depend on fire timing and intensity. With the No-action Alternative, stands would not be thinned or burned. As a result, both ladder and surface fuels would continue to increase over time, leading to an increase in the risk of a high-intensity wildfire. If a wildfire were to burn through the area there would be a greater risk of negative effects to moonworts as a result of no action.

Direct and Indirect Effects of No Action to Improve Watershed Conditions

Under Alternative 3 there would be no action taken at this time. There would be no moonwort plants affected. If the transportation system actions are proposed at any time in the future they would be analyzed appropriately at that time.

Cumulative Effects of No Action

There would be no cumulative effects under this alternative because no action would be taken and no effects from previous actions have been identified.

Lewisia kelloggii ssp. kelloggii (Kellogg's Lewisia)

There is one known occurrence, covering approximately 7 acres in the analysis area. It is located approximately ½ mile west of Gold Lake. The area is in unit 1100 and is proposed to be underburned only. No other activities are proposed in the area. This occurrence will be protected as a control area that is flagged and avoided according to the interim management prescription.

Direct and Indirect Effects of Treatments to Improve Forest Health, Aspen Stands and Meadow Systems

The one known occurrence of the Kellogg's Lewisia would not be directly affected by the Lakes Basin Project activities. This occurrence will be flagged and avoided. A control area that includes the site plus a buffer of 100 foot radius would be applied and no activities would take place within that area.

Indirect effects to Kellogg's Lewisia are unlikely. There will be no canopy removal or mechanical thinning in unit 1100 where the known occurrence is located. Unit 1100 is proposed to be underburned only. No other activities are proposed in that area. No ignition would be done

within the control area. It is unlikely that fire would spread to the control area containing these plants because there is very little fuel surrounding it.

Direct and Indirect Effects of Treatments to Improve Watershed Conditions

There would be no Kellogg's Lewisia sites affected by transportation improvements under Alternative 1. The locations of these proposed transportation system activities have been surveyed and no Kellogg's Lewisia plants were found.

Cumulative Effects

Previous activities in the area may have affected Kellogg's Lewisia. An authorized off-highway vehicle (OHV) trail exists approximately 60 feet from the edge of the known occurrence. The area between the OHV trail and the occurrence is sloped, very uneven, and covered with loose, angular, cobble-sized rock. It is unlikely that any motorized vehicles would ride from the authorized trail into the Kellogg's Lewisia occurrence.

In addition to the proposed activities other future foreseeable projects include Mills Peak Trail South, Gold Lake Highway Improvement, Yuba Project, ongoing firewood cutting, and Christmas tree cutting. The Mills Peak Trail South and Gold Lake Highway Improvement projects are both more than 2 miles from the Kellogg's Lewisia occurrence. The Gold Lake 4 x 4 Campground Pit Toilet Replacement is approximately 0.6 miles from the Kellogg's Lewisia site. It is highly unlikely that these projects would affect the moonwort occurrences.

The Yuba Project is on the adjacent Tahoe National Forest. The nearest activities proposed in that project are 2.5 miles east of the Kellogg's Lewisia site. Those activities may affect Kellogg's Lewisia in the Yuba Project area but the effects are not likely to be significant or lead to a trend to federal listing under the endangered species act (USDA 2017d).

Firewood and Christmas tree cutting is not permitted in the LBRA where the Kellogg's Lewisia site is located.

Alternative 2 – Spotted Owl Habitat Management Alternative

Direct and Indirect Effects of Treatments to Improve Forest Health, Aspen Stands and Meadow Systems

The indirect and direct effects of Alternative 2 on Kellogg's Lewisia would be identical to those of Alternative 1. The area where the known occurrence is located would receive the same treatment under both alternatives.

Direct and Indirect Effects of Treatments to Improve Watershed Conditions

There would be no Kellogg's Lewisia sites affected by transportation improvements under Alternative 2. The locations of these proposed transportation system activities have been surveyed and no Kellogg's Lewisia plants were found.

Cumulative Effects

The cumulative effects of Alternative 2 on Kellogg's Lewisia would be identical to those of Alternative 1. The area where these occurrences are located would receive the same treatment under both alternatives.

Alternative 3 – No-Action Alternative

Direct and Indirect Effects of No Action to Improve Forest Health, Aspen Stands and Meadow Systems

There would be no Kellogg's Lewisia plants directly affected by Alternative 3, because there would be no action taken at this time.

Although there are no direct effects from project activities, there are possible negative indirect effects from no action. Indirect effects from the No-action Alternative would be those associated with continued live and dead fuel accumulation with the current and future threat of wild fire.

Continued accumulation of live and dead fuel increases the risk of high-intensity wildfire. A high-intensity wildfire may kill plants. Wildfire is likely to leave the area at greater vulnerability to noxious weed invasion. However, fuels and canopy cover are sparse in the area of the known occurrence. It is unlikely that a fire in this area would burn at high-intensity.

Direct and Indirect Effects of No Action to Improve Watershed Conditions

Under Alternative 3 there would be no action taken at this time. There would be no Kellogg's Lewisia plants affected. If transportation system actions are proposed at any time in the future they would be analyzed appropriately at that time.

Cumulative Effects of No Action

There would be no cumulative effects under this alternative because no action would be taken and no effects from previous actions have been identified.

Summary of Determinations

It is my determination that all Alternatives may affect individuals of Kellogg's Lewisia but are not likely to lead to a loss of viability or trend toward federal listing as Threatened or Endangered. All alternatives are expected to maintain the existing plant occurrence within the project area as a result of implementing protection measures.

It is my determination that all Alternatives may affect individuals of sensitive moonworts but are not likely to lead to a loss of viability or trend toward federal listing as Threatened or Endangered. All alternatives are expected to avoid disturbing the known occurrences in the project area.

Specific Design Features or Mitigations

- All known occurrences of sensitive moonworts (Botrychium species) would be flagged and avoided by all project activities. See table 1 in Appendix C of the Lakes Basin Project Biological Evaluation for Threatened, Endangered, or Sensitive Plant Species (USDA 2018e) for specific locations and occurrence numbers.
- All known occurrences of Kellogg's Lewisia (Lewisia kelloggii ssp. kelloggii) would be flagged and avoided by all project activities. See table 1 in Appendix C of the Lakes Basin Project Biological Evaluation for Threatened, Endangered, or Sensitive Plant Species (USDA 2018e) for specific locations and occurrence numbers.
- For additional TES Plant species found during the life of this project, an assessment would be done and management prescriptions applied.

Non-native Invasive Plants

Known Noxious Weeds

The California Department of Food and Agriculture's (CDFA) noxious weed list (http://www.cdfa.ca.gov) divides noxious weeds into categories A, B, and C. A-listed weeds are subject to enforced action involving eradication, quarantine regulation, containment, rejection or other holding action. B-listed weeds are subject to eradication, containment, suppression, control, or other holding action at the discretion of the County Agricultural Commissioner. C-listed weeds are subject to regulations designed to retard spread or to suppress at the discretion of the individual County Agricultural Commissioner (CDFA 2017).

There are three noxious weed species listed by CDFA known to occur in the project area and each species is known from only one location. All three of these occurrences are alongside the Gold Lake Highway and within proposed treatment units. The weed occurrences include one B-list species known as barbed goat grass (*Aegilops triuncialis*) and two C-list species, scotch broom (*Cytisus scoparius*) and medusahead (*Elymus caput-medusae*). **These occurrences are considered high concern and will be flagged and avoided as control areas and therefore not disturbed by project activities.** PNF botanists treat these occurrences annually by hand pulling and/or removing the plants with shovels prior to their seeding.

Summary

There are high-priority weeds located in the analysis area. All of these occurrences are very small and have few individual plants. The three noxious weed occurrences nearest to the project will be hand pulled annually for the foreseeable future. Hand pulling is generally done before any seeds mature. Repeated visits to the site in the same summer will be done as time and funding allows and any plants found will be hand pulled.

The implementation of the Lakes Basin Project is predicted to result in a moderate-to-high potential for weed introduction and spread if all SMRs are adopted, and all road decommissioning and closure is implemented. If no noxious weed SMRs were incorporated into the project it is highly likely that new weeds would be introduced and become established in

project created suitable habitat. SMRs and the design of the Proposed Action would decrease the risk associated with habitat alteration expected as a result of the project. Monitoring during and after project implementation, avoidance of known sites, and treatment of any weed populations discovered during implementation will greatly reduce the chances of an uncontrollable spread of weeds in the project area.

Recreation and Scenic Resources

Existing conditions

The Lakes Basin Project proposes treatment on 5,463 acres including 3,708 acres within the Lakes Basin Recreation Area. There are a wide spectrum of recreation opportunities available to Forest visitors within and adjacent to the project area including a combination of developed and semi-primitive camping, resorts with historic lodges, equestrian stables, hiking, mountain bike, and motorized trails. Notable recreation opportunities include the Pacific Crest National Scenic Trail and Gold Lakes Scenic Byway. Table 65 contains a list of recreation sites in the Lakes Basin Recreation Area. Figure 13 shows National Forest System (NFS) trails within the project area.

Three Recreation Opportunity Spectrum (ROS) classes exist within the project area: Semi-primitive Motorized, Roaded Natural and Roaded Modified. Both Roaded classes will be combined into Roaded Natural for this report, as the classes are combined as Roaded Natural in ROS guidance. Two Visual Quality Objective (VQO) classes are present in the project area, Retention (High Scenic Integrity) and Partial Retention (Moderate Scenic Integrity). The location of the VQO classes within the project area is shown in Figure 18 in Appendix B.

Table 65. Recreation Sites in the Lakes Basin Recreation Area

Campgrounds	Trailheads	Lodges	Other Sites
Gold Lake Family	Frazier Falls	Gold Lake Lodge	Gold Lake Boat Ramp
Goose Lake	Round Lake	Elwell Lodge	Gold Lake Staging Area
Haven Lake	Long Lake	Gray Eagle Lodge	Gold Lake Picnic Area
Lakes Basin	Smith Lake		
Gold Lake 4 x 4			

Environmental Consequences

Alternative 1 – Proposed Action

Direct and Indirect Effects

Direct effects of the proposed action to recreation opportunities and scenery would include reduced hazards at recreation sites due to removal of hazard trees meeting Region 5 Hazard Tree Guidelines; increased opportunities for recreational scenic viewing due to the opening of vistas along the Gold Lake Highway; potential for loss of privacy screening (small trees and low branches) at recreation sites; and potential disruptions to visitor use and access caused by project implementation and/or closures.

All proposed actions within the Roaded Natural ROS Class are consistent with Forest Plan Recreation guidance, as it allows for sights and sounds of human activity and remoteness is of little relevance to the user experience. Additional project design criteria, listed below, would be added to alleviate potential conflicts during high use times of the year. High use days are defined as weekends and holidays between July 1st and October 1st.

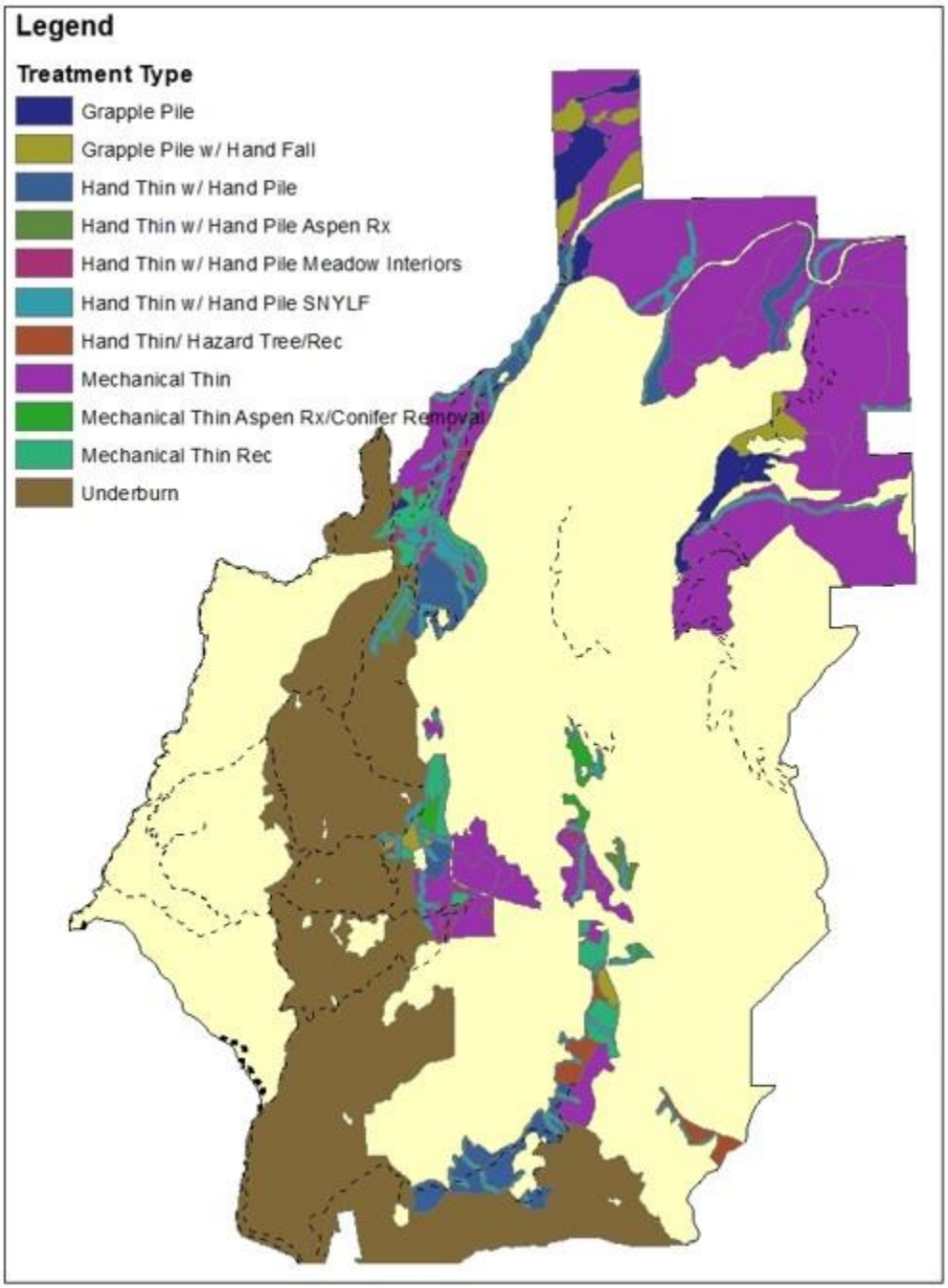

Figure 13. National Forest System Trails in Lakes Basin Project Area

Table 66. Units within the Semi-Primitive ROS Class ½ mile buffer (acres rounded to whole numbers) in the Lakes Basin Project

Unit Number	Acres	Unit Number	Acres
103/103A	9 ac.	121/121A	12 ac.
104/104A	73 ac.	122/122A	4 ac.
105/105A	23 ac.	123/123A	18 ac.
106/106A	62 ac.	124	28 ac.
108/108A	45 ac.	125	8 ac.
109/109A	7 ac	126	8 ac.
110/110A	6 ac.	135	4 ac.
111/111A	16 ac.	136/136A	5 ac.
112/112A	5 ac	137	5 ac.
113	30 ac.	138/138A	15 ac.
114	4 ac	139/139A	28 ac.
116/116A/B/C/D/E	70 ac.	140	2 ac.
117/117A	35 ac.	141	2 ac.
118/118A	10 ac.	209/209A	13 ac.
120/120A	18 ac.	Underburn	2,402 ac.

There are 2,402 acres of underburn treatment proposed within the Semi-Primitive Motorized ROS class, and 568 acres of other proposed treatments within the ½ mile buffer (Table 66). ROS guidance allows for "distant sight and sound of human activity" within this ROS Class. There would likely be disruption to recreation in this area during the underburning, as the area would be closed during and post-implementation for public safety. This effect could be reduced by choosing a window during a low use time, and providing ample public notice prior to implementation. A disruption to visitors' sense of remoteness may also occur during mechanical treatments to units within the ½ mile buffer. This can also be mitigated by project design criteria for Semi-Primitive ROS class, below. These mitigations would be implemented with the goal of reducing potential recreation effects to the low to moderate threshold, keeping effects to recreation well below the threshold of significance.

Within Roaded Natural ROS class, project activities would be permitted to occur at any time throughout the season, with the following exceptions:

- No heavy equipment may be operated in or around Campgrounds or Lodges during their operating season.
- No skidding across trails on high use days (weekends and holidays between July 1st and October 1st).
- No handwork in and around Campgrounds and Lodges during high use days.

- Any proposed road, trail, or area closures must be coordinated with Recreation specialists, and should be limited to low use days and times of year.
- Perform work that is near recreation sites and trails during shoulder seasons (after snow melt and prior to July 1st, and After October 1st and prior to snowfall) whenever possible.

Within 0.5-mile of the Semi-Primitive ROS class, project activities would be restricted to the same criteria as Roaded Natural, with the following additional exceptions:

- Avoid underburning or pile burning during high-use days (weekends and holidays).
- No heavy equipment or motorized tool use during high-use days (weekends and holidays).
- Perform work that within the 0.5-mile buffer during shoulder seasons (after snow melt and prior to July 1st, or after October 1st and prior to snowfall) whenever possible.

The Proposed Action has the potential to improve visual quality in the project area in the long term by improving forest health, developing scenic vistas, improving meadows and aspen stands, and creating openings in the landscape that would more closely represent the historic openings that have since been encroached upon by conifers. Negative effects to scenery can be mitigated through the application of mitigations listed in Table 6 above, derived from the Lakes Basin Project Recreation Opportunity and Visual Quality Report by Sam Commarto (USDA 2018f).

Table 67. List of treatments and need for mitigation in each Scenic Integrity (VQO) class

Treatment	Moderate (Partial Retention)	High (Retention)
Mechanical Thin	Consistent	Consistent w/ mitigation
Mechanical Thin/Rec	Consistent w/ mitigation	Consistent w/ mitigation
Hand Thin	Consistent	Consistent w/ mitigation
Hand Thin/ Rec Sites	Consistent w/ mitigation	Consistent w/ mitigation
Meadow Improvement	Consistent w/ mitigation	Consistent w/ mitigation
Aspen Improvement	Consistent w/ mitigation	Consistent w/ mitigation
Grapple Piles	Consistent	Consistent w/ mitigation
Temp Roads and Skid Trails	Consistent	Consistent w/ mitigation
Landings	Consistent w/ mitigation	Consistent w/ mitigation
Underburning	Consistent w/ mitigation	Consistent w/ mitigation

Indirect effects to recreation opportunities and scenery would include improved forest health which would result in fewer hazard trees in the future, lower potential for high severity wildfire and fewer of the associated negative impacts to visitor access.

Cumulative Effects

Present or future activities that overlap with the Lakes Basin Project may have cumulative effects to recreation and scenery resources. A complete list of such actions can be found in Appendix C. Activities listed that may have cumulative effects to recreation and scenery are Mills Peak Trail North and Mills Peak Trail South, Gold Lake 4x4 campground toilet replacement, and the Gold Lake Highway improvement project.

Both Mills Peak Trail projects included new trail construction within the project area and within or adjacent to treatment units. Construction of these trails will increase the opportunities for hiking and biking in the LBRA, and will not reduce any recreation opportunities.

Decommissioning of old alignments will not take place until new construction is complete, so no cumulative disruptions to recreation opportunities will occur. These projects will not have an appreciable effect to the visual quality objectives of the LBRA, so no cumulative impacts to VQOs are expected.

Gold Lake 4x4 Campground Toilet Replacement has very little potential to have an impact on scenery, and the only effect to recreation opportunity would be a site closure during replacement. This action would be coordinated to happen either during the off season, or some other time when the campground is closed, and could be coordinated to happen if and when the area is closed for implementation of this project. If the toilets are replaced during these times, it would not have a cumulative effect to recreation opportunities. If this is not possible, there may be a cumulative effect to recreation, which would need to be mitigated through installation during low use times and with ample notice to the public.

The Gold Lake Highway Improvement project is a proposal by Plumas County to upgrade guard rails on the highway between Graeagle and the Plumas/Tahoe County line. This project may have effects to recreation access, such as traffic controls and delays. The Forest Service will attempt to coordinate with Plumas County if implementation of both projects happen to be simultaneous. There is a possibility of a cumulative negative effect to recreation if traffic controls related to this project coincide with traffic controls or site closures during implementation.

Alternative 2 – Spotted Owl Habitat Management Alternative

Direct and Indirect Effects

Effects to recreation and scenery for Alternative 2 are approximated to be the same as the Proposed Action. See Proposed Action analysis for details.

Cumulative Effects

Effects to recreation and scenery for Alternative 2 are approximated to be the same as the Proposed Action. See Proposed Action analysis for details.

Alternative 3 – No-Action Alternative

Direct and Indirect Effects of No Action

If there are is no action, there will be no direct effects to the recreation and scenery resources. However, there are likely indirect effects to recreation and scenery due to the no action alternative. The first purpose of this project is to “Improve forest health and forest resiliency”, which is closely related to the scenic beauty and recreation setting available in the Lakes Basin Recreation Area. As indicated in the 2012 field evaluation of the Lakes Basin, unhealthy stand densities and high levels of forest fuel loading may contribute to future events that could dramatically degrade the condition of the recreation setting (Cluck 2012).

Examples of events linked to forest health that could degrade landscape scenic quality and recreation setting include: large scale tree mortality, similar to that occurring in the southern and central Sierra Nevada; continued conifer encroachment and competition which may result in replacement of aspen or meadow forest types; or high severity wildfire, exacerbated by fuel loading and tree mortality, which could quickly change the character and recreation opportunities in the LBRA.

Transportation

Existing conditions

There are approximately 9.3 miles of National Forest System roads within the project area. The Forest Service designates National Forest System roads and trails that are open to public motor vehicle travel on the Plumas National Forest Motor Vehicle Use Map. A comparison of proposed road actions with Travel Management Subpart A can be found in Appendix A of the Transportation Analysis Report for the Lakes Basin Project (USDA 2018g). In addition, the project area includes 3.5 miles of National Forest System motorized trails that are open only to vehicles 50 inches in width or less. In addition, there are numerous miles of non-system roads which were built in the past but have not been or are not currently maintained by the Forest Service and are not authorized for public use.

Table 68. National Forest System road miles in the project area, by operational maintenance level

Operational Maintenance Level	Type of Road	Miles
2	High Clearance Vehicles	3.9
3	Passenger Vehicles	2.3
5	High Degree Of User Comfort	3.1
	TOTAL	9.3 miles

In addition to the 9.3 miles of existing National Forest system roads within project area, there are 17.1 miles of roads under county or state jurisdiction. The road network within the project area is managed by the Forest Service, County and private landowners. Existing network road miles by jurisdiction within the project area are shown in Table 69.

Table 69. Existing transportation system road miles by jurisdiction

Jurisdiction	Miles
County	17.1
National Forest	9.3
State	0.0

The existing road system provides access for protection, administration, recreation, timber harvest, firewood gathering and other forest product removal, vegetation management, private land access and other forest management activities.

The Forest Service designates National Forest System roads and trails that are open to public motor vehicle travel on the Plumas National Forest Motor Vehicle Use Map.

Road condition surveys were completed on roads within the project area in 2013. Existing conditions for each surveyed road are included in the project record.

Environmental Consequences

Action Alternatives (Alternative 1 and Alternative 2)

Direct and Indirect Effects

There are approximately 9.3 miles of National Forest System roads within the project area. Currently, approximately 5.4 miles of those National Forest System roads are maintained and open to passenger car travel, highway legal vehicles and approximately 3.9 miles of roads are maintained for high clearance vehicles, open to all motor vehicles. In addition, the project area includes 3.5 miles of National Forest System motorized trails that are open only to vehicles 50 inches in width or less. Table 70 shows the existing maintenance levels for roads with proposed actions and the proposed maintenance level after implementation of the alternatives. This does not include all road miles in the project area, there are many roads where no action or change is proposed.

Table 70. Changes to operational maintenance levels with the proposed project

Maintenance Level	Maintenance Level Type	After implementation Alt 1, 2	Existing Alt 3
3	Passenger Vehicle	0.8	0.0
2	High Clearance Vehicle	0.3	0.0
0	Obliterate non-system roads	3.6	0.0

Haul Roads

Roads used for vegetation treatment access and product removal would be improved where needed to provide safe use while mitigating resource effects. Haul routes that access harvest units have been identified using geographical information systems. Specific maintenance and reconstruction needs were identified for each road. No system road construction is planned.

Road Maintenance activities would include: blading; brush clearing; removing roadside hazard trees; repair or replacing road surfaces; cleaning, repairing, or installing culverts, ditches, cross drains and other drainage structures; armoring cross drains, drainage outlets and ditches; dust abatement; removal and installing closure barriers; and installing or repairing signs. Maintenance activities generally do not disturb ground outside the existing roadway (toe of fill to top of cut) other than removing material around culvert inlets.

Road reconstruction could include clearing and grubbing shrubs and trees; replacing fill; reconditioning and surface improvement; blading; adding or installing surface material; ditch cleaning, reconstruction or construction; drainage dip or cross drain construction or reconstruction; installing or replacing culverts; adding culvert riprap fill (armoring catch basins and drainage outlets); installing low water crossings; installing other drainage or stabilization features; roadway realignment; widening to accommodate vehicles and harvest equipment; curve widening to accommodate truck off-tracking; adding or replacing signs. Reconstruction work could disturb areas outside the established roadway (top of cut to toe of fill). Reconstruction also includes actions described under maintenance, including removal of roadside hazard trees.

Road maintenance and reconstruction would be done in accordance with applicable best management practices and as required by project design features and mitigation measures or management requirements.

System Road Improvement for Water Quality

Improvements including surfacing, culvert replacement, cross drain and ditch construction and reconstruction, and other maintenance actions would be done to improve water quality.

Under proposed action alternatives 1 and 2, 9.3 miles of system roads would be improved/maintained to protect water quality and soil, approximately 7.0 miles would be improved and used for hauling, 0.0 miles of system road would be decommissioned and 3.6 miles of non-system road would be obliterated.

Temporary Roads

Under alternatives 1 and 2, approximately 11.0 miles of temporary roads (5 miles of new construction and 6 miles for reopening) would be constructed and used for harvest operations and obliterated after harvest operations are complete.

Twelve foot wide temporary roads would be adequate for equipment needed to harvest timber proposed for removal. Temporary road construction on 20 percent side slopes or less would average about 1.8 acres clearing per mile. Temporary roads constructed on 30 percent side slope would have an average 2.5 cleared acres per mile. Temporary roads constructed on 50 percent side slope would have about 3.5 cleared acres per mile. Total cleared area for proposed temporary road construction would be about 20 acres, less than 0.05 percent of the project area.

Temporary road construction would include clearing and grubbing, excavating, blading, installing drainage structures, seeding and obliteration or decommissioning after operations are complete.

Temporary roads would be obliterated or decommissioned and disturbed areas restored by, scarifying to reduce soil compaction where needed, drainage features restored, recontoured where needed, disturbed areas planted to reestablish vegetation cover and woody debris placed on the road bed clearing to discourage off road vehicle use after operations are complete.

Temporary roads would not become part of the long-term road system.

Decommissioning System Roads

Road decommissioning would be done to restore unneeded road beds to a more natural state. Decommissioned roads are not planned to be used again in the future and are removed from the transportation inventory.

Decommissioning would include pulling culverts accompanied with drainage restoration, water-barring where needed, ripping and mulching, and blocking the entrance. Drainage restoration would recreate and stabilize the natural, pre-road terrain features. 0.0 miles of system roads would be decommissioned under Alternatives 1 and 2.

Decommission Non-system Roads

Under alternatives 1 and 2, 3.6 miles of existing non-system roads would be obliterated or decommissioned and disturbed areas restored by, scarifying to reduce soil compaction where needed, drainage features restored, re-contoured where needed, disturbed areas planted to reestablish vegetation cover and woody debris placed on the road bed clearing to discourage off road vehicle use.

Existing Motorized Trails Used for Harvest Operations

Under Alternatives 1 and 2, motorized trails would not be impacted during timber operations.

Cumulative Effects

Present Activities

National Forest local roads maintenance and improvements are usually accomplished during timber harvest. Between harvest operations maintenance level 1 and 2 roads receive little or no maintenance unless work is needed to correct or prevent resource damage, or to meet recreation needs.

Temporary roads on National Forest System lands are obliterated or decommissioned after the use for which they were established is completed. Current Forest Service policy is to decommission temporary roads and monitor effectiveness of decommissioning (Forest Service Manual [FSM] 7703.2; FS BMP pp. 33-35).

Local roads on state or private lands are maintained by the landowners or by local government to a standard commensurate with use. Roads developed or maintained on private land for timber harvest are low standard and usually closed to public travel.

Additional road maintenance performed during project implementation, road reconstruction that would improve surface conditions, drainage feature function, culvert replacement, hazard tree removal, and roadside clearing would provide a transportation system for long-term safe efficient travel with high user comfort that would have minimum adverse effects on resources.

Under alternatives 1 and 2, short-term traffic from harvest operations and forest product removal would require adequate traffic control and proper communications to maintain safe and efficient traffic flow. A short-term reduction in public access would occur on some roads in order to minimize user conflicts during project implementation. Main collector and arterial forest roads would receive the majority of traffic and would have surface wear proportionate to the traffic volume. Road maintenance activities would ensure drainage feature function and improved road surface conditions.

Following implementation of alternatives 1 and 2 actions, a well maintained safer more efficient road system would exist and provide long-term public and administrative access in the project area.

Reasonably Foreseeable Future Actions

Road maintenance, construction, reconstruction, and decommissioning, will occur on the Beckwourth Ranger District, Plumas National Forest in the next 10 years to meet the needs of National Forest management activities, to meet the needs of forest users, and to meet environmental guidelines.

There is little information available for future road activities on private land. No large blocks of state land are within the cumulative effects boundary. Management, including timber harvest would continue on private land. Private land development would likely continue. Roads would be constructed and reconstructed in adjacent areas, the exact number of miles is unknown.

There are no new collector or arterial roads foreseen to be constructed by either the Forest Service, state, county, or private landowners.

Public recreation road use would likely stay the same or increase. The Forest Service will continue to work toward a road system that meets user needs within Forest Plan guidelines and other controlling regulations and laws. The Plumas National Forest's Motor Vehicle Use Map is republished annually. The map identifies authorized road use in the Plumas National Forest. Road signs on Forest Service system roads will continue to improve, which will help users identify system routes, help deter unauthorized road use and provide for effective administration.

Alternative 3 – No-Action Alternative

Under the No Action Alternative, there would be no timber harvest, no vegetation treatment, no road improvements and no project related road maintenance. Roads would be maintained under the annual road maintenance schedule as limited funds are available. Roads not needed for future management would not be decommissioned to reduce maintenance costs and benefit soil productivity, water quality and other resources.

Direct and Indirect Effects of No Action

Under the no-action alternative, limited road maintenance and no road improvements would lead to adverse resource impacts including improperly functioning road drainage structures.

Without the use of timber sale revenue, the Forest transportation system within the project area would not receive haul route maintenance and improvements described under alternative B, and would not likely retain desirable conditions for which the roads were designed.

Cumulative Effects of No Action

With no timber harvest related road maintenance and reconstruction improvements, other road surfaces would deteriorate proportionate to traffic volume. Maintenance and improvement activities are necessary to maintain drainage function. With limited maintenance, road standards would be reduced.

Cultural Resources

Environmental Consequences

Action Alternatives (Alternative 1 and Alternative 2)

Direct and Indirect Effects

Cultural Resource site boundaries are flagged and Standard Management Requirements would be followed during implementation of any of the action alternatives. All artifacts and features would be avoided during project implementation as directed by National Historic Preservation Act (NHPA). The one exception to this are the anticipated adverse effects to a historic log chute system that cannot be avoided by the project. The adverse effect to this historic property would be minimized through the installation of interpretive signage that will mitigate the loss of this resource by providing the public an opportunity to learn about the historic logging industry in this vicinity. This mitigation is outlined within an MOA executed between the Forest Service and the State Historic Preservation Officer (SHPO). Therefore, with the exception of the historic log chute, there would be no affect to historic properties while the adverse effect to the one historic property (log chute system) has been resolved in compliance with Section 106 of the NHPA.

Alternative 3 – No-Action Alternative

Direct and Indirect Effects of No Action

With no proposed activity, there would be no effect to cultural resources.

Cumulative Effects

There would be no direct or indirect effects to cultural resources from any of the alternatives therefore there would be no cumulative effects.

Legal Regulatory Compliance and Consultation

The Beckwourth Ranger District operates under a diverse array of local, State and Federal management guidance and policy as well as various executive orders.

Currently, the Beckwourth Ranger District is guided by the Plumas National Forest 1988 Land and Resource Management Plan (LRMP) as amended by the 2004 Sierra Nevada Forest Plan Amendment (SNFPA) supplemental EIS and ROD.

Principle Environmental Laws

National Environmental Policy Act

The Council on Environmental Quality (CEQ) regulations for implementing the National Environmental Policy Act (NEPA) requires that Federal agencies rigorously explore and objectively evaluate all reasonable alternatives and briefly discuss the reasons for eliminating any alternatives that were not developed in detail (40 Code of Federal Regulations [CFR] 1502.14).

The Lakes Basin Project meets the CEQ regulations requiring public scoping and a thorough analysis of issues, alternatives and effects.

National Forest Management Act

The National Forest Management Act (NFMA) reorganized, expanded and otherwise amended the Forest and Rangeland Renewable Resources Planning Act of 1974, which called for the management of renewable resources on national forest lands. The NFMA Act requires the Secretary of Agriculture to assess forest lands, develop a management plan for each unit of the National Forest System (NFS).

The Forest Service is complying with the provisions of this law by designing the project to meet the Standards and Guidelines of the Plumas Forest Plan and its amendments.

Endangered Species Act

The Endangered Species Act of 1973 (16 USC 1531 et seq.) requires that any action authorized by a Federal agency not be likely to jeopardize the continued existence of a threatened or endangered (TE) species, or result in the destruction or adverse modification of habitat of such species that is determined to be critical. Section 7 of the ESA, as amended, requires the responsible federal agency to consult with the United States Fish and Wildlife Service (USFWS) and the National Marine Fisheries Service concerning TE species under their jurisdiction. It is Forest Service policy to analyze impacts to TE species to ensure management activities are not be likely to jeopardize the continued existence of a TE species, or result in the destruction or adverse modification of habitat of such species that is determined to be critical. This assessment is documented in a Biological Assessment (BA) and is summarized in this EA.

Clean Water Act

Section 208 of the Clean Water Act required the States to prepare non-point source pollution plans, which were to be certified by the State and approved by the Environmental Protection Agency (EPA). In response to this law and in coordination with the State of California Water Resources Control Board (SWRCB) and EPA, Region 5 began developing Best Management

Practices (BMPs) for water quality management planning on National Forest System lands within the State of California in 1975.

The Lakes Basin Project meets the Clean Water Act by implementing the Best Management Practices of the Soil and Water Conservation Handbook. By using BMPs, the Lakes Basin Project meets this Act according to the ROD of the SNFPA (Section VII, USDA 2004a).

Clean Air Act

The Clean Air Act provides the principal framework for national, state and local efforts to protect air quality. Under the Clean Air Act, the Office of Air Quality Planning and Standards is responsible for setting standards for pollutants which are considered harmful to people and the environment. The 1990 Clean Air Act is the most recent version of a law first passed in 1970.

All burning that will be done on the Lakes Basin Project will be in accordance with an approved smoke management plan approved by the Northern Sierra Air Quality Management District (NSAQMD). The smoke plan requires burning with wind directions that transport smoke away from communities and the amount of acres burned daily are limited. Burns are conducted during approved burn days, when atmospheric conditions favor smoke dispersion. Prescribed burning takes place in spring or fall after the first rains when fuels are relatively moist to reduce the potential for fire escape.

National Historic Preservation Act

Section 101 of the National Environmental Policy Act (NEPA) requires the federal government to preserve important historic, cultural and natural aspects of our natural heritage. To accomplish this, federal agencies utilize the Section 106 process of the National Historic Preservation Act (NHPA). This process has been codified in 36 CFR 800 Subpart B. The coordination or linkage between the Section 106 process of the NHPA and the mandate to preserve our national heritage under NEPA is well understood and is formally established in 36 CFR 800.3b and 800.8. Locally, the Plumas National Forest uses a programmatic agreement (PA) between Region 5 of the US Forest Service, the California State Historic Preservation Officer and the Advisory Council on Historic Preservation to implement the Section 106 process (USDA 2013).

The Lakes Basin Project meets NHPA by protecting cultural resources through field survey, tribal and historical preservation society consultation and protection of sites in the Lakes Basin Project area. All artifacts and features would be avoided during project implementation as directed by the National Historic Preservation Act, therefore, with the exception of one site, there would be no effect on historic properties. This one property will be adversely effected, however this effect is being minimized/mitigated through measures outlined within a Memorandum of Agreement (MOA) executed with the California State Historic Preservation Officer (SHPO) and will not impede the outcome of the proposed project. Therefore, with the exception of the one site, there would be no affect to historic properties while the adverse effect to the one historic property (log chute system) has been resolved in compliance with Section 106 of the NHPA.

Biological Resources – Compliance and Consultation

Compliance with Federal Laws - Consultation with USFWS

Wildlife and Fisheries

An Official Species List of Federal Endangered and Threatened Species that may be affected by the Lakes Basin Project was provided by the US Fish and Wildlife Service on January 23, 2018 (accessed via https://ecos.fws.gov/ipac/).

Botany

The latest US Fish and Wildlife Service (USFWS) species list for Plumas County, in which the project occurs, was accessed from the USFWS website on September 27, 2017. This list fulfills the requirements to provide a current species list pursuant to Section 7(c) of the Endangered Species Act, as amended.

The only Federally Threatened plant species known to occur on the Plumas NF is *Packera layneae* (Layne's butterweed). This species grows in open rocky areas on gabbro and serpentine-derived soils that are between 650 and 3,300 feet in elevation. Two additional species of federal concern that have the potential to occur on the Plumas NF are the Federally Threatened *Orcuttia tenuis* (slender Orcutt grass) and *Ivesia webberi* (Webber's ivesia). *Orcuttia tenuis* is limited to relatively deep vernal pools with clay soil. *Ivesia webberi* is found in open areas of sandy volcanic ash to gravelly soils in sagebrush and eastside pine. Based on past and current surveys, documented rare plant occurrences, and known habitats in the project area, no Threatened, Endangered, or Candidate Species are considered likely to occur in the Botany analysis area.

Compliance with California Department of Fish and Wildlife

California Department of Fish and Wildlife

Input specific to the Lakes Basin Project was solicited from the Department of Fish and Wildlife through the public scoping process. However, since no input was received, all past advice from the Department was considered during the planning of the Lakes Basin Project.

Compliance with law, regulation, and policy pertaining to botanical resources

Executive Orders

Consultation and coordination with Indian Tribal governments, Executive Order 13175 of November 6, 2000

See below under coordination.

Indian Sacred Sites, Executive Order 13007 of May 24, 1996

Through scoping and consulting with local Native American tribes, it was determined by District Archeologist that there were no known Indian sacred sites in the Lakes Basin Project.

Invasive Species, Executive 13112 of February 3, 1999

Executive Order 13112 created the Invasive Species Council (ISC) in order to prevent the introduction of invasive species, provide for their control and minimize the economic, ecological and human health impacts that invasive species cause. Federal agencies are required to:

- Identify actions that may affect the status of invasive species
- Use relevant programs and authorities to prevent the introduction, control and monitoring of invasive species
- Provide for native species restoration as well as their habitats
- Promote public information
- Not condone or carry out actions that may spread invasive species
- Consult with the ISC and other stakeholders as appropriate

The Lakes Basin Project meets the Executive Order by following the noxious weed management Standards and Guidelines in Appendix A of 2004 SNFPA ROD. The SNFPA guidelines direct proactive management of noxious weeds that meet with the Executive Order. District botanists carried out the intent of the Executive Order and the noxious weeds Standards and Guides by:

- Identifying and controlling weed infestation areas
- Preventing the spread of noxious weeds through SMRs and site specific mitigation
- Educating the public regarding the presence and spread of noxious weeds

Floodplain management, Executive Order 11988 of May 24, 1977 and Protection of Wetlands, Executive Order 11990 of May 24, 1977

Executive Orders 11988 and 11990 require Federal agencies to avoid, to the extent possible, short- and long-term effects resulting from the occupancy and modification of flood plains and the modification or destruction of wetlands. These executive orders are intended to preserve the natural and beneficial values served by floodplains and wetlands.

The Lakes Basin Project meets these executive orders by implementing the Best Management Practices (BMP) of the Soil and Water Conservation Handbook. By using BMPs, the Lakes Basin Project meets the executive orders according to the ROD of the SNFPA (Section VII, ROD of the SNFPA).

Environmental Justice, Executive Order 12898 of February 11, 1994

Executive Order 12898 requires that Federal agencies make achieving environmental justice part of their mission by identifying and addressing, as appropriate, disproportionately high and adverse human health and environmental effects of their programs, policies and activities on minority and low-income populations.

Although low-income and minority populations are within the vicinity of the Lakes Basin Project, activities associated with the project would not discriminate against them. Proposed activities

would not adversely affect community, social, economic and health and safety factors. Public scoping was conducted in accordance with NEPA regulations to identify any potential issues or hazards associated with the Lakes Basin Project.

Special Area Designations

The selected alternative will need to comply with laws, regulations and policies that pertain to the following special areas:

Research Natural Areas

There are no Research Natural Areas within the Lakes Basin Project area.

Inventoried Roadless Areas

There are no Inventoried Roadless Areas within the Lakes Basin Project area.

Wilderness Areas

There are no Wilderness Areas within the Lakes Basin Project area.

Wild and Scenic Rivers

There is one eligible Wild and Scenic River, Frazier Creek, within the Lakes Basin Project area. The Outstanding Remarkable Values (ORVs) for which this creek was recommended for designation are Recreation and Hydrologic features. Activities within 0.25-mile of each bank of an eligible reach of a river or stream will be managed consistent with the direction for Wild and Scenic Rivers until eligibility and river classification is determined. The Project will comply with the Wild and Scenic River Act and Wild and Scenic River Prescription of the PNF Forest Plan policies:

- Meet VQO of retention, requiring a natural-appearing landscape where management activities are not visually evident to the casual forest visitor.
- To protect recreational, scenic, fish and wildlife values, use appropriate special cutting methods for unscheduled yields without forest regulation. Harvest timber only to maintain or enhance user safety and scenic quality, protect special habitat, or prevent insect or disease epidemic.
- Protect and enhance the values (recreation and hydrologic features) which caused it to be included (or proposed for inclusion) in the system.

Municipal Watersheds

Appendix I of the Plumas National Forest EIS for the Land and Resource Management Plan (USDA 1988b), identifies the following municipal water supply systems and watersheds that are within the Lakes Basin project: Graeagle Land and Water Company that is located in the Gray Eagle Creek watershed (includes Lower and Upper Gray Eagle Creek analysis watersheds) and Clio Public Utility District that is located in the Mohawk Creek watershed. The Gray Eagle Creek watershed contains approximately 87% NFS lands, and within this watershed, Long Lake flows

into Gray Eagle Creek which provides domestic water for the town of Graeagle. Additionally, the Mohawk Creek watershed contains approximately 67% NFS lands and within this watershed Mohawk Creek is the domestic water supply for Clio and is used for irrigation of pastureland in Mohawk Valley.

The Lakes Basin Project provides appropriate implementation of standards and guidelines of the Forest Plan (USDA 1988a), standard management requirements (Appendix D), and watershed mitigation measures (Appendix C of the Lakes Basin Project Water and Soil Resource Effects Assessment (USDA 2018d)). Furthermore, by implementing Best Management Practices (BMPs) the Lakes Basin Project meets the requirements of the Clean Water Act, and therefore will have no significant effects to domestic water supplies within these watersheds.

Tribal Consultation

Susanville Indian Rancheria

Greenville Rancheria

Washoe Tribe of California and Nevada

Maidu Summit Consortium

Consultation with Federal, State, and Local Agencies

Regional Water Quality Control Board

Plumas County

US Fish and Wildlife Service

State Historic Preservation Officer (SHPO) of the California Office of Historic Preservation

Advisory Council on Historic Preservation

Finding of No Significant Impact

As the responsible official, I am responsible for evaluating the effects of the project relative to the definition of significance established by the CEQ Regulations (40 CFR 1508.13). I have reviewed and considered the EA and documentation included in the project record, and I have determined that the proposed action and alternatives will not have a significant effect on the quality of the human environment. As a result, no environmental impact statement will be prepared. My rationale for this finding is as follows, organized by sub-section of the CEQ definition of significance cited above.

Context

For the proposed action and alternatives the context of the environmental effects is based on the environmental analysis in this document. The Lakes Basin Project is a site-specific action that does not have international, national, regional, or statewide importance. This project is limited in scope and duration. This project encompasses 5,463 acres on the Plumas National Forest and was designed to minimize environmental effects with implementation of mitigations, best management practices (BMPs), project-specific design criteria, and standard management requirements (SMRs). Given the context of duration of activities, the analyses prepared in support of this EA indicate that the alternatives would not pose significant short or long-term effects.

Intensity

Intensity is a measure of the severity, extent, or quantity of effects, and is based on information from the effects analysis of this EA and the references in the project record. The effects of this project have been appropriately and thoroughly considered with an analysis that is responsive to concerns and issues raised by the public. The agency has taken a hard look at the environmental effects using relevant scientific information and knowledge of site-specific conditions gained from field visits. My finding of no significant impact is based on the context of the project and intensity of effects using the ten factors identified in 40 CFR 1508.27(b).

1. Impacts that may be both beneficial and adverse. A significant effect may exist even if the Federal agency believes that on balance the effect will be beneficial.

Effects determinations are summarized in this EA and supporting analysis, incorporated by reference. Both beneficial and adverse effects have been taken into consideration when making the determination of significance. Beneficial effects have not, however, been used to offset or compensate for potential significant adverse effects in the evaluation of resources. The impacts associated with the proposed action have been considered separately from the beneficial effects, and the adverse impacts of this project would not be significant (pgs. 31-139, Lakes Basin Economics Report, pgs. 7-10, Lakes Basin Air Quality Report, pgs. 8-13).

2. The degree to which the proposed action affects public health or safety.

There will be no significant effects on public health and safety because project specific design features (Tables 5a, 5b, and 6), mitigations and implementation of SMRs (Appendix D).

Access and harvest operations will involve the use of mechanical equipment, falling of trees, hauling of harvest products on NFS roads, county roads and state highways; and use of prescribed fire, all of which potentially pose risks to workers and to the public. Such risks would be reduced because the public will be alerted to active harvest areas and haul routes on Forest roads would be clearly signed and monitored as required in contract provisions to warn and protect the public from project activities. Roads within the project area may be closed to the recreating public on a temporary basis for safety reasons. These closures would be of limited duration (Timber Sale Contract Provisions).

The entire project area is contained in the Northern Sierra Air Quality Management District (NSAQMD) within the Mountain Counties Air Basin. In accordance with Title 17 of the California Code of Regulations, a smoke management plan would be submitted to and approved by the NSAQMD prior to any prescribed fire ignitions that are part of this alternative. Due to adherence to the burn plan including a mandatory smoke management plan, daily coordination among local fire management officials (Air Quality Management Districts, the California Air Resources Board, the Geographical Area Coordination Center meteorologists and agencies that are conducting prescribed fire operations) and Air Quality Management District requirements for burning and managing other project activities, it is unlikely that emissions caused by the project would exceed California Air Quality Standards for the Air Quality Management District (Air Quality Report, p. 11).

Fugitive dust from operations would be mitigated by standard management requirements and contract requirements for road watering or other dust abatement techniques (Appendix D).

3. Unique characteristics of the geographic area such as the proximity to historical or cultural resources, parklands, prime farmlands, wetlands, wild and scenic rivers, or ecologically critical areas.

The Lakes Basin Project area has an abundance of historical and cultural resources. All artifacts and features would be avoided during project implementation as directed by the National Historic Preservation Act, therefore, with the exception of one site, there would be no effect on historic properties. This one property will be adversely effected, however this effect is being minimized/mitigated through measures outlined within a Memorandum of Agreement (MOA) executed with the California State Historic Preservation Officer (SHPO) and will not impede the outcome of the proposed project. The Lakes Basin Project will have no significant effects to historic or cultural resources (see #8 below).

The Lakes Basin area contains a Critical Aquatic Refuge. Design features, standard buffers, and BMPs for wetlands and riparian areas would protect this area during project implementation activities (Appendix D). Lakes Basin Project also has one eligible wild and scenic river, Frazier Creek. Activities within 0.25-mile of each bank of Frazier Creek will be managed consistent with the direction for Wild and Scenic Rivers (Plumas LRMP Rx2) until eligibility and river classification is determined. Harvesting timber to enhance safety and scenic quality is consistent with these standards and guidelines (USDA 1988a. page 4-70).

4. The degree to which the effects on the quality of the human environment are likely to be highly controversial.

The effects on the quality of the human environment are not likely to be highly controversial. The proposed project follows the management direction in the Plumas National Forest Land and Resource Management Plan (USDA 1988a), as amended by the 2004 Sierra Nevada Forest Plan Amendment FSEIS and ROD (USDA 2004 a, b). The Forest Supervisor approved the harvest of timber within the semi-primitive area prescription, as required (USDA 2016).

5. The degree to which the possible effects on the human environment are highly uncertain or involve unique or unknown risks.

The Forest Service has considerable experience implementing the activities in this project. The possible effects of implementing Alternative 1 or 2 are neither highly uncertain nor would they present unique or unknown risks. The consequences of these actions are known, as described in each specialist report (pgs. pgs. 31-139 and incorporated by reference in Lakes Basin Project record). The harvest of timber proposed within the Semi-primitive Area requires the approval of the Forest Supervisor and this approval has been obtained (USDA 2016).

6. The degree to which the action may establish precedent for future actions with significant effects or represents a decision in principle about a future consideration.

The Lakes Basin Project is site-specific and the implementation of this decision will not establish a precedent for future actions with significant effects or represent a decision in principle about a future consideration. Any additional resource projects within or adjacent to the project area will require a separate environmental analysis at that time.

7. Whether the action is related to other actions with individually insignificant but cumulatively significant impacts. Significance exists if it is reasonable to anticipate a cumulatively significant impact on the environment. Significance cannot be avoided by terming an action temporary or by breaking it down into small component parts.

This action would not cause potential significant cumulative adverse impacts when considered in combination with other past, ongoing, or reasonably foreseeable future actions.

A cumulative effects analysis was completed separately for each resource area. The geographic scope of the cumulative effects analysis area varied among resource areas (pgs. 31-139). None of the specialists found the potential for significant adverse cumulative effects resulting from this project (pgs. 31-139). A summary of actions considered in each cumulative effects analysis is contained in Appendix C.

8. The degree to which the action may adversely affect districts, sites, highways, structures, or objects listed in or eligible for listing in the National Register of Historic Places or may cause loss or destruction of significant scientific, cultural, or historical resources.

This action would have no effect, with one exception, on districts, sites, highways, structures, or objects listed in or eligible for listing in the National Register of Historic Places, or cause the loss or destruction of significant scientific, cultural, or historic properties. The one exception to this are the anticipated adverse effects to a historic log chute system that cannot be avoided by the project. The adverse effect to this historic property would be minimized through the installation of interpretive signage that would mitigate the loss of this resource by providing the public an opportunity to learn about the historic logging industry in this vicinity. This mitigation is outlined within a Memorandum of Agreement (MOA) executed between the Forest Service and the State Historic Preservation Officer (SHPO). Therefore, with the exception of the historic log chute, there would be no affect to historic properties while the adverse effect to the one historic property (log

chute system) has been resolved in compliance with Section 106 of the National Historic Preservation Act (NHPA).

9. The degree to which the action may adversely affect an endangered or threatened species or its habitat that has been determined to be critical under the Endangered Species Act of 1973.

The Proposed Action (Alternative 1) may affect and is likely to adversely affect, the Sierra Nevada yellow-legged frog, and may affect and is likely to adversely affect designated critical habitat. Project design features, such as equipment exclusion zones, limited operating periods, and prescribed burning restrictions would mediate potential effects to Sierra Nevada yellow-legged frogs. All applicable Standards and Guidelines (S&Gs), Best Management Practices (BMPs), Project Standard Management Requirements (SMRs) (Appendix D), and design elements (Tables 5a, 5b, and 6) would be implemented with all land disturbing activities proposed in either Alternative 1 or Alternative 2 to reduce the potential for impacts to occur to individual frogs and their habitat. Consultation with US Fish and Wildlife Service (USFWS) was completed on February 8, 2018 (USDI 2018). The USFWS concurred with our determination that this project would be likely to adversely affect SNYLF and likely to adversely affect designated critical habitat. The Forest Service was granted incidental take of one individual SNYLF and the capture and relocation of up to five SNYLF for this project. The USFWS determined that this incidental take is not likely to result in jeopardy to the SNYLF and the Lakes Basin project can proceed as planned with the specified mitigations. If more than one frog is killed or injured or if more than five frogs are captured and relocated as a result of project implementation, the Forest Service would need to reinitiate formal consultation with USFWS as required under 50 CFR 402.16. Per the USFWS concurrence letter: adverse effects to SNYLF shall be minimized to the maximum extent feasible; the Forest Service shall include the avoidance, minimizing, and reporting measures precisely as described in the S&Gs and BMPs as stated in Appendices A and B of the Amended Programmatic Biological Opinion (USDI 2018).

10. Whether the action threatens a violation of Federal, State, or local law or requirements imposed for the protection of the environment.

The Proposed Action would not violate Federal, State, and local laws or requirements for the protection of the environment (pgs. 139-145). The actions are consistent with the 1988 Plumas National Forest Land and Resource Management Plan (USDA 1988a) as amended by the Sierra Nevada Forest Plan Amendment FEIS and ROD (USDA 2004a,b). It is consistent with all applicable laws and policies (described under Legal Regulatory Compliance and Consultation, pages 139-145).

References

Agee, J. K. 1993. Fire Ecology of Pacific Northwest Forests. Island Press. Washington, DC.

Agee, J. K. 2002. The fallacy of passive management: managing for fire safe forest reserves. Conservation in Practice, p. 6.

Agee, J. K. and C. N. Skinner. 2005. Basic Principles of Forest Fuel Reduction Treatments. Forest Ecology and Management, 211:83-96.

AMSET 2014. Adaptive Management Services Enterprise Team Lakes Basin Underburn Project Surveys. PNF Internal document, available at the Beckwourth Ranger Station.

Beaty, R. M. and A. H. Taylor. 2001. Spatial and Temporal Variation of Fire Regimes in a Mixed Conifer Forest Landscape, Southern Cascades, California, USA. Journal of Biogeography, 955-966.

Bond, M.L.; D.E. Lee; R.B. Siegel; and J.P. Ward. 2009. Habitat Use and Selection by California Spotted Owls in a Post-fire Landscape. The Journal of Wildlife Management, 73:1116–1124.

Bosakowski, T. 1999. The Northern Goshawk. Ecology, Behavior, and Management in North America. Hancock House Publishers, Ltd. 80 p.

Burns, R. M. and B. H. Honkala. [Technical coordinators]. 1990. Silvics of North America: Volume 1. Conifers. United States Department of Agriculture (USDA), Forest Service, Agriculture Handbook 654.

CDFA 2017. California Department of Food and Agriculture ENCYCLOWEEDIA: Notes on Identification, Biology, and Management of Plants Defined as Noxious Weeds by California Law. http://www.cdfa.ca.gov/phpps/ipc/encycloweedia/encycloweedia_hp.htm. Accessed October 29, 2017.

CEQ 1971. 40 CFR 1508.7 Cumulative impacts.

Chamberlain, T. W.; R. D. Harr; and F. H. Everest. 1991. Timber Harvesting, Silviculture, and Watershed Processes. In Influences of Forest and Rangeland Management on Salmonid Fishes and Their Habitats. American Fisheries Society Special Publication 19:181-205.

Cluck, D. 2012. Insect and disease evaluation of the Lakes Basin Recreation Area. USDA Forest Health Protection Pacific Southwest Region Northeastern California Shared Service Area. FHP Report NE12-01: 18 p.

Cochran, P. H. and W. Dahms. 2000. Growth of lodgepole pine thinned to various densities on two sites with differing productivities in central Oregon. Res. Pap. PNW-RP-520.

Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 59 p.

DeByle, N. B. 1984. Managing wildlife habitat with fire in the aspen ecosystem. In: Fire's effects on wildlife habitat-symposium proceedings. USDA GTR INT-186.

Duenas, A. 2017. Lakes Basin Project Water and Soil Resource Effects Assessment.

Erickson, H. E.; R. L. Edmonds; C. E. Peterson. 1985. "Decomposition of logging residues in Douglas-fir, western hemlock, Pacific silver fir, and ponderosa pine ecosystems." Canadian Journal of Forest Research: 914-921.

Evans, A. M.; R. G. Everett; S. L. Stephens; and J. A. Youtz. 2011. Comprehensive fuels treatment practices for mixed conifer forests: California, Central and Southern Rockies, and the Southwest. Forest Guild and USDA Forest Service. 106p.

Fernandes, P. M. and H. S. Botelho. 2003. A review of prescribed burning effectiveness in fire hazard reduction. International Journal of Wildland Fire 12:117-128.

Fites-Kaufman, J. A. 1997. Historic landscape pattern and process: fire, vegetation, and environment interactions in the northern Sierra Nevada. Seattle, WA: University of Washington.

Fites-Kaufman, J. A.; P. Rundel; N. Stephenson; and D. A. Weixelman. 2007. Montane and Subalpine Vegetation of the Sierra Nevada and Cascade Ranges.

FSH 1909.1 Section 15.1. 2012. Forest Service Handbook, National Headquarters, Washington, DC.

Goode, Jaime, R.; Luce, C. H.; Buffington; and J. M. 2012. "Enhanced sediment delivery in a changing climate in semi-arid mountain basins: Implications for water resource management and aquatic habitat in the northern Rocky Mountains." Geomorphology: Vol 139-140, 1-15.

Grigal, D. 2000. "Effects of extensive forest management on soil productivity." Forest Ecology and Management (F): 167-185.

Gross, S. and Coppoletta M. 2013. Historic Range of Variability for Meadows in the Sierra Nevada and South Cascades. USDA Forest Service.

Hargis, C. D., J. A. Bissonette, and D. L. Turner. 1999. The influence of forest fragmentation and landscape pattern on American martens. Journal of Applied Ecology 36:157-172.

Helms, J. A. 1998. The Dictionary of Forestry. The Society of American Foresters. Bethesda, MD. 210p.

Helms, J. A. and J. C. Tappeiner. 1996. Silviculture in the Sierra. Status of the Sierra Nevada. Volume II. Assessments and Scientific Basis for Management Options. Davis, University of California Wildland Resources Center Report No. 37.

Hubbert, K. R.; M. Busse; S. Overby; C. Shestak; and R. Gerrard. 2015. “Pile Burning Effects on Soil Water Repellency, Infiltration, and Downslope Water Chemistry in the Lake Tahoe Basin, USA.” Fire Ecology: Vol 11 (2) 100-118.

Jones, B.E.; T.H. Rickman; A. Vazquez; Y. Sado; and K.W. Tate. 2005. Removal of Encroaching Conifers to Regenerate Degraded Aspen Stands in the Sierra Nevada. Restoration Ecology 13(2): 373-379.

Jones, G.M; R.J. Gutierrez; D.J. Tempel; S.A. Whitmore; W.J. Berigan; and M.Z. Peery. 2016. Megafires: an emerging threat to old-forest species. Frontiers in Ecology and the Environment 14(6):300-306.

Kolka, R.K. and M.F. Smidt. 2004. "Effects of forest road amelioration techniques on soil bulk density, surface runoff, sediment transport, soil moisture, and seedling growth." Forest Ecology and Management 202: 313-323.

Krasnow, K. D. and S. L. Stephens. 2015. Evolving paradigms of aspen ecology and management: impacts of stand condition and fire severity on vegetation dynamics. Ecosphere 6(1):12. http://dx.doi.org/10.1890/ES14-00354.1

Lane, A. 2003. Wildland Fire Use in the Lakes Basin Recreation Area, Plumas National Forest.

Lanner, R. M. 1999. Conifers of California. First edition. Cachuma Press. Los Olivos, CA. 274p.

Long, J. and J. Shaw. 2012. A density management diagram for even-aged Sierra Nevada mixed-conifer stands. Western Journal of Applied Forestry 27(4).

Millar, C. I.; N.L. Stephenson; S. L. Stephens. 2007. Climate change and forests of the future: managing in the face of uncertainty. Ecological Applications, 17(8), pp. 2145-2151.

Miller, J. D.; and H. D. Safford. 2017. Corroborating evidence of a pre-euro-American low-to-moderate fire regime in yellow pine-mixed conifer forests of the Sierra Nevada, California, USA. Fire Ecology. (13)1: 58-90.

Moody, J.A. and D. A. Martin. 2009. “Synthesis of sediment yields after wildland fire in different rainfall regimes in the western United States”. International Journal of Wildland Fire 18, 96–115.

Moody, T. J.; J. Fites-Kaufman; and S. L. Stephen. 2006. Fire history and climate influences from forests in the northern Sierra Nevada, USA. Fire Ecology. (2)1: 115-141.

Moriarty, K., C.W. Epps, W.J. Zielinski. 2016. Forest Thinning Changes Movement Patterns and Habitat Use by Pacific Marten. Journal of Wildlife Management. 80 (4):621-633.

North, M.P, ed. 2012. Managing Sierra Nevada forests. Gen. Tech. Rep. PSW-GTR-237. Albany, CA: U.S. Department of Agriculture, Forest Service, Pacific Southwest Research Station. 184p.

North, M.P.; P. Stine; K. O'Hara; W. Zielinski; and S. L. Stephens, eds. 2009. An ecosystem management strategy for Sierran mixed-conifer forests. 2nd edition with addendum. Gen. Tech. Rep. PSW-GTR-220. Albany, CA: U.S. Department of Agriculture, Forest Service, Pacific Southwest Research Station. 49 p.

North, M. P.; Kane, J. T.; Kane, V. R.; Asner, G. P.; Berigan, W.; Churchill, D. J.; Conway, S.; Gutiérrez, R.J.; Jeronimo, S.; Keane, J.; Koltunov, A.; Mark, T.; Moskal, M.; Munton, T.; Peery, Z.; Ramirez, C.; Sollmann, R.; White, A.; and Whitmore, S. 2017. Cover of tall trees best predicts California spotted owl habitat. Forest Ecology and Management. 405:166-178. https://doi.org/10.1016/j.foreco.2017.09.019.

North, M., editor. 2012. Managing Sierra Nevada Forests. Gen. Tech. Rep. PSW-GTR-237. Albany, CA: U.S. Department of Agriculture, Forest Service, Pacific Southwest Research Station. 184 p.

NWCG. 2004. National Wildfire Coordinating Group Fireline Handbook. Boise, ID, USA: Incident Operations Standards Working Team.

Oliver, W. W.; G. T Ferrell; J. C. Tappeiner. 1996. Density management of Sierra Forests. Sierra Nevada Ecosystem Project: Chapter 11, Final Report to Congress, Volume III. Assessments and scientific basis for management options. University of California, Centers for water and wildland resources, Davis, CA.

Powers, R. F.; Scott, D. A.; Sanchez, F. G.; Voldseth, R. A.; Page-Dumroese, D.; Elioff, J. D.; and Stone, D. M.. 2005. "Long Term Soil Productivity." Forest Ecology and Management, 2005: 31-50.

Price, P. W. 1991. The plant vigor hypothesis and herbivore attack. Oikos 62:244-21.

Rebain, S. A. comp. 2010. The Fire and Fuels Extension to the Forest Vegetation Simulator: Updated Model Documentation. Internal Rep. Fort Collins, CO: U. S. Department of Agriculture, Forest Service, Forest Management Service Center. 403p (revised December 30, 2014).

Richardson, C. T. and C. K. Miller. 1997. Recommendations for protecting raptors from human disturbance: a review. Wildlife Society Bulletin 25:634-638.

Roberts, S. L.; J. W. van Wagtendonk; A. K. Miles; and D. A. Kelt. 2011. Effects of fire on spotted owl site occupancy in a late-successional forest. Biological Conservation 144:610–619.

Rogers, P.C.; W.D. Shepperd; and D.L. Bartos. 2007. Aspen in the Sierra Nevada: Regional Conservation of a Continental Species. Natural Areas Journal 27(2):183-193.

Safford, H. D. and J. T. Stevens. 2017. Natural range of variation for yellow pine and mixed-conifer forests in the Sierra Nevada, southern Cascades, and Modoc and Inyo National Forests, California, USA. Gen. Tech. Rep. PSW-GTR-256. Albany, CA: U.S. Department of Agriculture, Forest Service, Pacific Southwest Research Station. 229p.

Salafsky, S.R.; R.T. Reynolds; B.R. Noon; and J.A. Wiens. 2007. Reproductive Responses of Northern Goshawks to Variable Prey Populations. J. of Wildlife Management. 71(7):2274-2283.

Schroeder, M.; and C. Buck. 1970. Fire weather: a guide for application of meteorological information to forest fire control operations. USDA Agricultural Handbook 360.

Shepperd, W.D.; P.C. Rogers; D. Burton and D.L. Bartos. 2006. Ecology, Biodiversity, Management, and Restoration of Aspen in the Sierra Nevada. Gen. Tech. Rep. RMRS-GTR-178. Fort Collins, CO: US Department of Agriculture, Forest Service, Rocky Mountain Research Station. 122 p.

Sherlock, J. W. 2007. Integrating stand density management with fuel reduction. USDA Forest Service General Technical Report, PSW-GTR-203.

Skinner, C. N., and C. R. Chang. 1996. Fire Regimes Past and Present. Davis, CA: Davis: University of California, Centers for Water and Wildland Resources.

Spiegel, L. H. and P. W. Price. 1996. Plant aging and the distribution of Rhyacionia neomexicana (Lepidoptera: Tortricidae). Population Ecology 25: 359-365.

Stein, S. J.; P. W. Price; W. G. Abrahamson; and C. F. Sacchi. 1992. The effects of fire on stimulating willow regrowth and subsequent attack by grasshoppers and elk. Oikos 65: 190-196.

Stephens, S. L. 2001. Fire History Difference in Adjacent Jeffery Pine and Upper Montane Forests in the Eastern Sierra Nevada. International Journal of Wildland Fire, 161-167.

Stephens, S. L. 2005. Forest fire causes and extent on United States Forest Service lands. International Journal of Wildland Fire, 213-222.

Stephens, S. L.; and B. M. Collins. 2004. Fire Regimes of Mixed Conifer Forests in the North-Central Sierra Nevada at Multiple Spatial Scales. Northwest Science: 12-23.

Stephens, S. L.; and L. W. Ruth. 2005. Federal Forest-Fire Policy in the United State. Ecological Applications: 532-542.

Stephens, S. L., and J. J. Moghaddas. 2005. Experimental fuel treatment impacts on forest structure, potential fire behavior, and predicted tree mortality in a California mixed conifer forest. Forest Ecology and Management: 21-36.

Stephens, S.L.; R.E. Martin; and N. E. Clinton. 2007. Prehistoric fire area and emissions from California's forests, woodlands, shrublands, and grasslands, Forest Ecology and Management 251:205-216.

Stephens, S.L.; S.W. Bigelow; R.D. Burnett; B.M. Collins; C.V. Gallagher; J.J. Keane; D.A. Kelt; M.P. North; L.J. Roberts; P.A. Stein, and D.H. Van Vuren. 2014. California Spotted Owl, Songbird, and Small Mammal Responses to Landscape Fuel Treatments. BioScience 64: 893–906.

Stephens, S.L.; Moghaddas, J.J.; Edminister, C.; Fiedler, C.E.; Hasse, S.; Harrington, M.; Keeley, J.E.; Knapp, E.E.; McIver, J.D.; Metlen, K.; Skinner, C.N.; Youngblood, A. 2009. Fire treatment effects on vegetation structure, fuels, and potential fire severity in western U.S. forests. Ecological Applications, 19(2), pp. 305-320.

Syracuse Environmental Research Associates (SERA). 2006. Borax (Sporax), Human Health and Ecological Risk Assessment - FINAL REPORT. Fayetteville, New York. Syracuse Environmental Research Associates, Inc.

Syracuse Environmental Research Associates (SERA). 2016. Sporax and Cellu-Treat (Selected Borate Salts), Human Health and Ecological Risk Assessment. Manlius, New York. Syracuse Environmental Research Associates, Inc.

Syracuse Environmental Research Associates 2016. Sporax and Cellu-Treat Human Health and Ecological Risk Assessment, Final Report. SERA TR-056-15-03c.

Syracuse Environmental Research Associates, Inc. 2006. Human Health and Ecological Risk Assessment for Borax (Sporax and Cellu-treat) Final Report. October 17, 2016.

Taylor, A. 2000. Fire Regimes and Forest Changes in Mid and Upper Montane Forests if the Southern Cascades, Lassen Volcanic National Park, California, USA. Journal of Biogeography: 87-104.

Taylor, A. H. 2004. Identifying Forest Reference Conditions on Early Cut-over Lands, Lake Tahoe Basin, USA. Ecological Applications: 1903-1920.

Thompson, J. and F. Swanson. 2007. Mountain meadows-here today, gone tomorrow? Meadow science and restoration. PNW Science Findings. Pacific Northwest Research Station. USDA Forest Service. Portland, OR. Issue 94.

USDA 1988a. Plumas National Forest Land and Resource Management Plan. USDA Forest Service Plumas National Forest, Quincy, CA.

USDA 1988b. Plumas National Forest Environmental Impact Statement for the Land and Resource Management Plan. USDA Forest Service, Pacific Southwest Region, Vallejo, CA.

USDA 1988c. Soil Resource Inventory. USDA Forest Service, Plumas National Forest, Quincy, CA.

USDA 1988d. Cumulative Off-site Effects Analysis, Interim Directive No. 1. Soil and Water Conservation Handbook. FSH.2509.22, Chapter 20. San Francisco: USDA Forest Service.

USDA 1999. Lassen, Plumas, Tahoe National Forests. Herger-Feinstein Quincy Library Group Forest Recovery Act FEIS and ROD. EIS, Quincy: USDA, 1999.

USDA 2001. Sierra Nevada Forest Plan Amendment (SNFPA) Final Environmental Impact Statement (FEIS) and Record of Decision (ROD). USDA Forest Service, Pacific Southwest Region. Vallejo, CA. January 2001.

USDA 2001. Sierra Nevada Forest Plan Amendment (SNFPA) Final Environmental Impact Statement (FEIS) and Record of Decision (ROD). USDA Forest Service, Pacific Southwest Region. Vallejo, CA. January 2001.

USDA 2004a. Sierra Nevada Forest Plan Amendment (SNFPA) Final Supplemental Environmental Impact Statement (FSEIS), USDA Forest Service, Pacific Southwest Region. Vallejo, CA. January 2004.

USDA 2004b. Record of Decision Sierra Nevada Forest Plan Amendment. USDA Forest Service Pacific Southwest Region, Vallejo, CA.

USDA 2004c. Blackwell, J. Conifer forest density management for multiple objectives. USDA Forest Service Pacific Southwest Region, Vallejo, CA.

USDA 2004d. Landram, M. Oversight and functional assistance trip report: density management on the Plumas National Forest. May 18-20, 2004. Region 5 Forest Vegetation Program Manager, USDA Forest Service Pacific Southwest Region, Vallejo, CA.

USDA 2008. 2007 HFQLG Implementation Team Soil Monitoring Report. Quincy: USDA.

USDA 2010a. Plumas National Forest Public Motorized Travel Management Final Environmental Impact Statement (FEIS). USDA Forest Service, Quincy, CA.

USDA 2010b. Plumas National Forest Public Motorized Travel Management Record of Decision (ROD). USDA Forest Service, Quincy, CA.

USDA 2012a. Supplement No.: 2500-2012-1, Forest Service Manual 2500, Chapter 2550, Soil Management. USDA Forest Service, Washington, DC.

USDA 2012b. National Best Management Practices for Water Quality Management on National Forest System Lands, Volume 1: National Core BMP Technical Guide. FS-990a. USDA Forest Service, Washington D.C.

USDA 2012c. PNF Annual Report for the BMP Evaluation Program 2010-2012. Quincy: US Forest Service.

USDA 2013. Programmatic Agreement among the USDA Forest Service, Pacific Southwest Region (Region 5), California State Historic Preservation Officer, Nevada State Historic Preservation Officer, and the Advisory Council on Historic Preservation Regarding the Processes for Compliance with Section 106 of the National Historic Preservation Act for Management of Historic Properties by the National Forests of the Pacific Southwest Region.

USDA 2014. Biological Assessment for Actions that Affect the Sierra Nevada Yellow-legged Frog, N. DPS Mountain Yellow-legged Frog, and Yosemite Toad on National Forest lands in the Sierra Nevada. June 13, 2014.

USDA 2015. Draft California Spotted Owl Interim Recommendations for Management. US Forest Service, Pacific Southwest Region 5. August 20, 21015.

USDA 2015a. 2015 Forest Health Alert. Drought and Bark Beetle-Caused Tree Mortality in California.

USDA 2016. Plumas Forest Supervisor letter to file regarding Lakes Basin Project. USDA Forest Service, Quincy, California.

USDA 2017a. Lakes Basin Project Biological Assessment for the Sierra Nevada Yellow-legged Frog and Designated Critical Habitat by Debbie Bliss, USDA Forest Service, Beckwourth Ranger District, Blairsden, California.

USDA 2017b. Lakes Basin Project Management Indicator Species Report by Debbie Bliss, USDA Forest Service, Beckwourth Ranger District, Blairsden, California.

USDA 2017c. Lakes Basin Migratory Bird Species Report by Debbie Bliss, USDA Forest Service, Beckwourth Ranger District, Blairsden, California.

USDA 2017d. Draft Environmental Assessment for the Yuba Project. Tahoe National Forest, Yuba River Ranger District. http://fs.usda.gov/projects/tahoe/landmanagement/projects

USDA 2017e. Letter to file regarding delegation of authority from Forest Supervisor to District Ranger. USDA Forest Service, Plumas National Forest, Quincy, California.

USDA 2018a. Lakes Basin Project Forest Vegetation Report by Paul Czeszynski. USDA Forest Service, Beckwourth Ranger District, Blairsden, California.

USDA 2018b. Lakes Basin Project Fire and Fuels report by Don Fregulia, USDA Forest Service, Beckwourth Ranger District, Blairsden, California.

USDA 2018c. Lakes Basin Project Biological Evaluation Terrestrial and Aquatic Wildlife by Debbie Bliss, USDA Forest Service, Beckwourth Ranger District, Blairsden, California.

USDA 2018d. Lakes Basin Project Water and Soil Resource Effects Assessment by Antonio Duenas, USDA Forest Service, Beckwourth Ranger District, Blairsden, California.

USDA 2018e. Lakes Basin Project Biological Evaluation for Threatened, Endangered or Sensitive Plant Species by Mike Friend, USDA Forest Service, Beckwourth Ranger District, Blairsden, California.

USDA 2018f. Lakes Basin Project Recreation Opportunity and Visual Quality Report by Sam Commarto, USDA Forest Service, Beckwourth Ranger District, Blairsden, California.

USDA 2018g. Transportation Analysis Report for the Lakes Basin Project by Christopher Frappier, USDA Forest Service, Plumas National Forest, Quincy, California.

USDA 2018h. Cultural Resources Compliance for the Environmental Analysis of the Lakes Basin Project by Mary Kliejunas, USDA Forest Service, Beckwourth Ranger District, Blairsden, California.

USDA 2018i. Lakes Basin Project Economics Report by Kasandra Meyer, USDA Forest Service, Beckwourth Ranger District, Blairsden, California.

USDA 2018j. Lakes Basin Project Air Quality Report by Martin Senter, USDA Forest Service, Beckwourth Ranger District, Blairsden, California.

USDI 1999. U.S. Fish and Wildlife Service Comments, Review and Informal Consultation on the Draft EIS for HFQLGFRA (HR 858 and S1028) Pilot Project on National Forest Service Lands of the Lassen, Plumas and Portions of the Tahoe National Forest, Butte, Lassen, Nevada, Plumas, Shasta, Sierra, Tehama, and Yuba Counties. August 17th, 1999.

USDI 2001. U.S. Fish and Wildlife Service Biological Opinion on the Sierra Nevada Forest Plan Amendment Biological Assessment. January 11th, 2001. 200 pp.

USDI 2018. U.S. Fish and Wildlife Service Appendage of Five Projects in Two Forest Programs in Four national Forests to the Amended Programmatic Biological Opinion for the Endangered Sierra Nevada Yellow-legged Frog, Endangered Northern Distinct Population Segment of Mountain Yellow-legged Frog, and the Threatened Yosemite Toad. Letter to Randy Moore, Regional Forester, dated February 8, 2018. USDI Fish and Wildlife Service, Sacramento, CA.

Weatherspoon, P. C. 1996. Fire-Silviculture Relationships in Sierra forests. Sierra Nevada Ecosystem Project, Final Report to Congress, vol. II, Assessments and Scientific Basis for Management Options (University of California, Davis, Centers for Water and Wildland Resources).

Wieslander, A. E.; H. S. Yates; H. A. Jensen; and P. L. Johannsen. 1935. Manual of Field Instructions for Vegetation Type Map of California.

Appendix A - Proposed treatments

Table 71 includes a description of each treatment prescription for each unit in each of the action alternatives. The treatments and acres in Table 71 were used for all analyses in this EA and in the associated specialist reports. After reviewing the comments received and conducting additional ground surveys to assess the layout of the project, 405 acres of mechanical thin units were modified to have a treatment prescription of either hand thin or grapple pile. The new total acres for each treatment proposed under this update to Alternative 1 is displayed in Table 72 and the location of the treatments is shown in Figure 16 in Appendix B. Because these edits all changed to treatments with fewer impacts, no additional effects analysis was required.

Table 71. Lakes Basin unit specific treatment prescriptions and corresponding acres.

Unit Number	Prescription		Acres*
	Alternative 1	Alternative 2	
101	Hand Thin with Hand Pile		18
101a	Hand Thin with Hand Pile SNYLF	Hand Thin with Hand Pile SNYLF	10
102	Hand Thin with Hand Pile		16
102a	Hand Thin with Hand Pile SNYLF	Hand Thin with Hand Pile SNYLF	7
103	Mechanical Thin VDT		17
103a	Hand Thin with Hand Pile SNYLF	Hand Thin with Hand Pile SNYLF	4
104	Mechanical Thin VDT		68
104a	Hand Thin with Hand Pile SNYLF	Hand Thin with Hand Pile SNYLF	14
105	Mechanical Thin VDT		19
105a	Hand Thin with Hand Pile SNYLF	Hand Thin with Hand Pile SNYLF	5
106	Hand Thin with Hand Pile		61
106a	Hand Thin with Hand Pile SNYLF	Hand Thin with Hand Pile SNYLF	14
108	Mechanical Thin Recreation		45
108a	Hand Thin with Hand Pile SNYLF	Hand Thin with Hand Pile SNYLF	15
109	Mechanical Thin VDT		6
109a	Hand Thin with Hand Pile SNYLF	Hand Thin with Hand Pile SNYLF	2
110	Mechanical Thin Recreation		4
110a	Hand Thin with Hand Pile SNYLF	Hand Thin with Hand Pile SNYLF	2
111	Mechanical Thin Recreation		15
111a	Hand Thin with Hand Pile SNYLF	Hand Thin with Hand Pile SNYLF	2
112	Hand Thin with Grapple Pile		2
112a	Hand Thin with Hand Pile SNYLF	Hand Thin with Hand Pile SNYLF	2
113	Mechanical Thin VDT		31
114	Mechanical Thin Recreation		4
116	Mechanical Thin VDT		32
116a	Hand Thin with Hand Pile SNYLF	Hand Thin with Hand Pile SNYLF	8

Unit Number	Alternative 1 Prescription	Alternative 2 Prescription	Acres*
116b	Hand Thin with Hand Pile	Hand Thin with Hand Pile	15
116c	Hand Thin with Hand Pile SNYLF	Hand Thin with Hand Pile SNYLF	4
116d	Mechanical Thin Recreation	Mechanical Thin Recreation	11
116e	Hand Thin with Hand Pile SNYLF	Hand Thin with Hand Pile SNYLF	<1
117	Hand Thin with Hand Pile Aspen		22
117a	Hand Thin with Hand Pile SNYLF	Hand Thin with Hand Pile SNYLF	14
118	Mechanical Thin Recreation		8
118a	Hand Thin with Hand Pile SNYLF	Hand Thin with Hand Pile SNYLF	2
120	Mechanical Thin Aspen		12
120a	Hand Thin with Hand Pile SNYLF	Hand Thin with Hand Pile SNYLF	7
121	Hand Thin with Grapple Pile		9
121a	Hand Thin with Hand Pile SNYLF	Hand Thin with Hand Pile SNYLF	3
122	Hand Thin with Hand Pile Meadow		2
122a	Hand Thin with Hand Pile SNYLF	Hand Thin with Hand Pile SNYLF	2
123	Mechanical Thin VDT		23
123a	Hand Thin with Hand Pile SNYLF	Hand Thin with Hand Pile SNYLF	<1
124	Mechanical Thin VDT		28
125	Mechanical Thin VDT		12
126	Mechanical Thin VDT		24
127	Mechanical Thin Aspen		17
127a	Hand Thin with Hand Pile SNYLF	Hand Thin with Hand Pile SNYLF	6
128	Mechanical Thin VDT		10
128a	Hand Thin with Hand Pile SNYLF	Hand Thin with Hand Pile SNYLF	3
129	Mechanical Thin VDT		12
130	Mechanical Thin VDT		22
130a	Hand Thin with Hand Pile SNYLF	Hand Thin with Hand Pile SNYLF	4
131	Mechanical Thin Aspen		7
131a	Hand Thin with Hand Pile SNYLF	Hand Thin with Hand Pile SNYLF	<1
133	Mechanical Thin Aspen		4
133a	Hand Thin with Hand Pile SNYLF	Hand Thin with Hand Pile SNYLF	5
134	Hand Thin with Hand Pile Aspen		10
134a	Hand Thin with Hand Pile SNYLF	Hand Thin with Hand Pile SNYLF	5
135	Grapple Pile		4
136	Hand Thin with Hand Pile Meadow		4
136a	Hand Thin with Hand Pile SNYLF	Hand Thin with Hand Pile SNYLF	<1

Unit Number	Alternative 1 Prescription	Alternative 2 Prescription	Acres*
137	Hand Thin with Hand Pile Meadow		5
138	Hand Thin with Hand Pile Meadow		9
138a	Hand Thin with Hand Pile SNYLF	Hand Thin with Hand Pile SNYLF	8
139	Hand Thin with Hand Pile Meadow		13
139a	Hand Thin with Hand Pile SNYLF	Hand Thin with Hand Pile SNYLF	23
140	Hand Thin with Hand Pile Meadow		2
141	Hand Thin with Hand Pile Meadow		2
142	Hand Thin with Hand Pile Meadow		7
142a	Hand Thin with Hand Pile SNYLF	Hand Thin with Hand Pile SNYLF	3
200	Mechanical Thin VDT		5
200a	Hand Thin with Hand Pile SNYLF	Hand Thin with Hand Pile SNYLF	<1
201	Mechanical Thin Recreation		15
201a	Hand Thin with Hand Pile SNYLF	Hand Thin with Hand Pile SNYLF	2
202	Mechanical Thin Recreation		23
202a	Hand Thin with Hand Pile SNYLF	Hand Thin with Hand Pile SNYLF	4
203	Hand Thin with Hand Pile Recreation		23
203a	Hand Thin with Hand Pile SNYLF	Hand Thin with Hand Pile SNYLF	7
204	Mechanical Thin VDT		40
204a	Hand Thin with Hand Pile SNYLF	Hand Thin with Hand Pile SNYLF	2
205	Hand Thin with Hand Pile		18
205a	Hand Thin with Hand Pile SNYLF	Hand Thin with Hand Pile SNYLF	9
206	Hand Thin with Hand Pile		9
206a	Hand Thin with Hand Pile SNYLF	Hand Thin with Hand Pile SNYLF	1
207	Hand Thin with Hand Pile		24
207a	Hand Thin with Hand Pile SNYLF	Hand Thin with Hand Pile SNYLF	5
208	Hand Thin with Hand Pile		26
208a	Hand Thin with Hand Pile SNYLF	Hand Thin with Hand Pile SNYLF	9
209	Hand Thin with Hand Pile		17
209a	Hand Thin with Hand Pile SNYLF	Hand Thin with Hand Pile SNYLF	2
210	Hand Thin with Hand Pile Recreation		4
210a	Hand Thin with Hand Pile SNYLF	Hand Thin with Hand Pile SNYLF	1

Unit Number	Alternative 1 Prescription	Alternative 2 Prescription	Acres*
211	Hand Thin with Hand Pile Recreation		12
211a	Hand Thin with Hand Pile SNYLF	Hand Thin with Hand Pile SNYLF	2
212	Hand Thin with Hand Pile Recreation		8
212a	Hand Thin with Hand Pile SNYLF	Hand Thin with Hand Pile SNYLF	5
213	Mechanical Thin Recreation		3
213a	Hand Thin with Hand Pile SNYLF	Hand Thin with Hand Pile SNYLF	<1
214	Hand Thin with Grapple Pile		10
214a	Hand Thin with Hand Pile SNYLF	Hand Thin with Hand Pile SNYLF	<1
301	Mechanical Thin VDT		43
302	Hand Thin with Grapple Pile		16
303	Mechanical Thin VDT		65
303a	Hand Thin with Hand Pile SNYLF	Hand Thin with Hand Pile SNYLF	<1
304	Mechanical Thin VDT		8
305	Grapple Pile		10
306	Hand Thin with Grapple Pile		11
307	Mechanical Thin VDT		22
308	Grapple Pile		54
309	Hand Thin with Grapple Pile		19
309a	Hand Thin with Hand Pile SNYLF	Hand Thin with Hand Pile SNYLF	<1
310	Hand Thin with Grapple Pile		14
401	Mechanical Thin VDT		22
401a	Hand Thin with Hand Pile SNYLF	Hand Thin with Hand Pile SNYLF	6
402	Mechanical Thin VDT		121
404	Mechanical Thin VDT		186
404a	Hand Thin with Hand Pile SNYLF	Hand Thin with Hand Pile SNYLF	22
406	Mechanical Thin VDT		72
406a	Hand Thin with Hand Pile SNYLF	Hand Thin with Hand Pile SNYLF	3
407	Mechanical Thin VDT		242
407a	Hand Thin with Hand Pile SNYLF	Hand Thin with Hand Pile SNYLF	1
408	Mechanical Thin VDT		160
408a	Hand Thin with Hand Pile SNYLF	Hand Thin with Hand Pile SNYLF	6
408b	Hand Thin with Hand Pile		18
409a	Mechanical Thin VDT		39
409b	Mechanical Thin VDT		18
410	Mechanical Thin VDT		103

Unit Number	Alternative 1 Prescription	Alternative 2 Prescription	Acres*
411	Grapple Pile		15
412	Mechanical Thin VDT		28
412a	Hand Thin with Hand Pile SNYLF	Hand Thin with Hand Pile SNYLF	8
413	Mechanical Thin VDT		45
414	Grapple Pile		43
414a	Hand Thin with Hand Pile SNYLF	Hand Thin with Hand Pile SNYLF	<1
416	Mechanical Thin VDT		159
416a	Hand Thin with Hand Pile SNYLF	Hand Thin with Hand Pile SNYLF	9
417	Hand Thin with Grapple Pile		33
418	Mechanical Thin VDT		66
418a	Hand Thin with Hand Pile SNYLF	Hand Thin with Hand Pile SNYLF	9
419	Mechanical Thin VDT		31
419a	Hand Thin with Hand Pile SNYLF	Hand Thin with Hand Pile SNYLF	2
420	Mechanical Thin VDT		88
421	Mechanical Thin VDT		79
421a	Hand Thin with Hand Pile SNYLF	Hand Thin with Hand Pile SNYLF	2
422	Hand Thin with Hand Pile		27
423	Hand Thin with Hand Pile		11
423a	Hand Thin with Hand Pile SNYLF	Hand Thin with Hand Pile SNYLF	1
424	Hand Thin with Hand Pile		5
424a	Hand Thin with Hand Pile SNYLF	Hand Thin with Hand Pile SNYLF	4
425	Grapple Pile		14
425a	Hand Thin with Hand Pile SNYLF	Hand Thin with Hand Pile SNYLF	1

*Acres have been rounded to nearest whole number

Table 72. Proposed treatment prescriptions for Alternative 1 including updates

Treatment Type	Alternative 1 Acres	Rx5 original	Rx5 update	Rx8 original	Rx8 update	Change
Wildland Urban Interface (WUI)						
Grapple Pile	72	0	0	0	0	0
Grapple Pile with Hand Thin	69	8	58	0	0	+50
Hand Thin with Hand Pile	21	0	12	6	6	+12
Hand Thin with Hand Pile -– Meadows	10	10	10	0	0	0
Hand Thin with Hand Pile -– SNYLF	21	6	6	1	1	0
Hand Thin with Hand Pile -– Recreation	4	4	4	0	0	0
Mechanical Thin - VDT	424	56	14	9	9	-42
Mechanical Thin - Aspen	1	1	1	0	0	0
Mechanical Thin - Recreation	20	20	0	0	0	-20
Underburn Only	54	40	40	14	14	0
Total WUI	**696**	**145**	**145**	**30**	**30**	**0**
General Forest						
Grapple Pile	67	0	0	14	14	0
Grapple Pile with Hand Thin	47	10	78	16	36	+88
Hand Thin with Hand Pile	245	171	321	64	140	+226
Hand Thin with Hand Pile - Meadows	33	25	25	8	8	0
Hand Thin with Hand Pile - SNYLF	280	164	164	64	64	0
Hand Thin with Hand Pile - Recreation	44	44	59	0	0	+15
Hand Thin with Hand Pile - Aspen	32	21	35	11	11	+14
Mechanical Thin - VDT	1,522	217	72	276	201	-220
Mechanical Thin - Aspen	38	14	0	24	24	-14
Mechanical Thin - Recreation	109	88	0	21	0	-109
Mechanical Thin – CSO HRCA	N/A	0	0	0	0	0
No Treatment CSO HRCA	N/A	0	0	0	0	0
Underburn Only	2,350	661	661	1689	1689	0
Total General Forest	**4,767**	**1,415**	**1,415**	**2,187**	**2,187**	**0**
Total Project Treatment Acres	**5,463**					

Table 73. Proposed road work for the Lakes Basin Project area.

Road Identification Number	Road Status	Action	Miles
22N98 and 22N42	System	Maintenance	7.1
22N42	System	Reconstruction	2.2
21N10A	Non-System	Existing road – Add to system	0.2
21N10B	Non-System	Existing road – Add to system	0.1
21N10C	Non-System	Existing road – Add to system	0.0
21N10D	Non-System	Existing road – Add to system	0.5
NSR1	Non-System	Obliterate	0.4
NSR3	Non-System	Obliterate	0.2
NSR4	Non-System	Obliterate	0.3
NSR5	Non-System	Obliterate	0.0
NSR6	Non-System	Existing road - Add to system	0.1
NSR7	Non-System	Obliterate	0.12
NSR8	Non-System	Obliterate	0.1
NSR9	Non-System	Obliterate	0.1
NSR10	Non-System	Obliterate	0.2
NSR11	Non-System	Obliterate	0.1
NSR12	Non-System	Obliterate*	0.3
NSR12A	Non-System	Obliterate	0.5
NSR14	Non-System	Existing road - Add to system	0.2
NSR15	Non-System	Existing road - Add to system	0.0
NSR16	Non-System	Obliterate	0.1
NSR17	Non-System	Obliterate	0.1
NSR18	Non-System	Obliterate	0.0
NSR19	Non-System	Obliterate	0.0
NSR20	Non-System	Obliterate	0.1
NSR21	Non-System	Obliterate	0.2
NSR21A	Non-System	Obliterate	0.0
NSR21B	Non-System	Obliterate	0.1
NSR22	Non-system	Obliterate	0.1
NSR23	Non-system	Obliterate	0.1
NSR24	Non-system	Obliterate	0.0
NSR26	Non-system	Obliterate	0.0
NSR27	Non-system	Obliterate	0.3
NSR27A	Non-system	Obliterate	0.0
NSR27B	Non-system	Obliterate	0.2

Note: Mileages may vary slightly at the time of final road package development. 0.0 in the sum of miles column means the road segment is 0.04 or less.

*Obliteration of this non-system road would be delayed until after project implementation due to an existing mining claim.

Appendix B – Maps

This appendix includes maps of alternatives that were used in analysis (Figure 14 and Figure 15). Figure 16 shows Alternative 1 updated as described in Table 72 in Appendix A. Figure 17 shows the proposed transportation activities and locations. Figure 18. shows the location of Visual Quality Objectives (VQOs) within the project area.

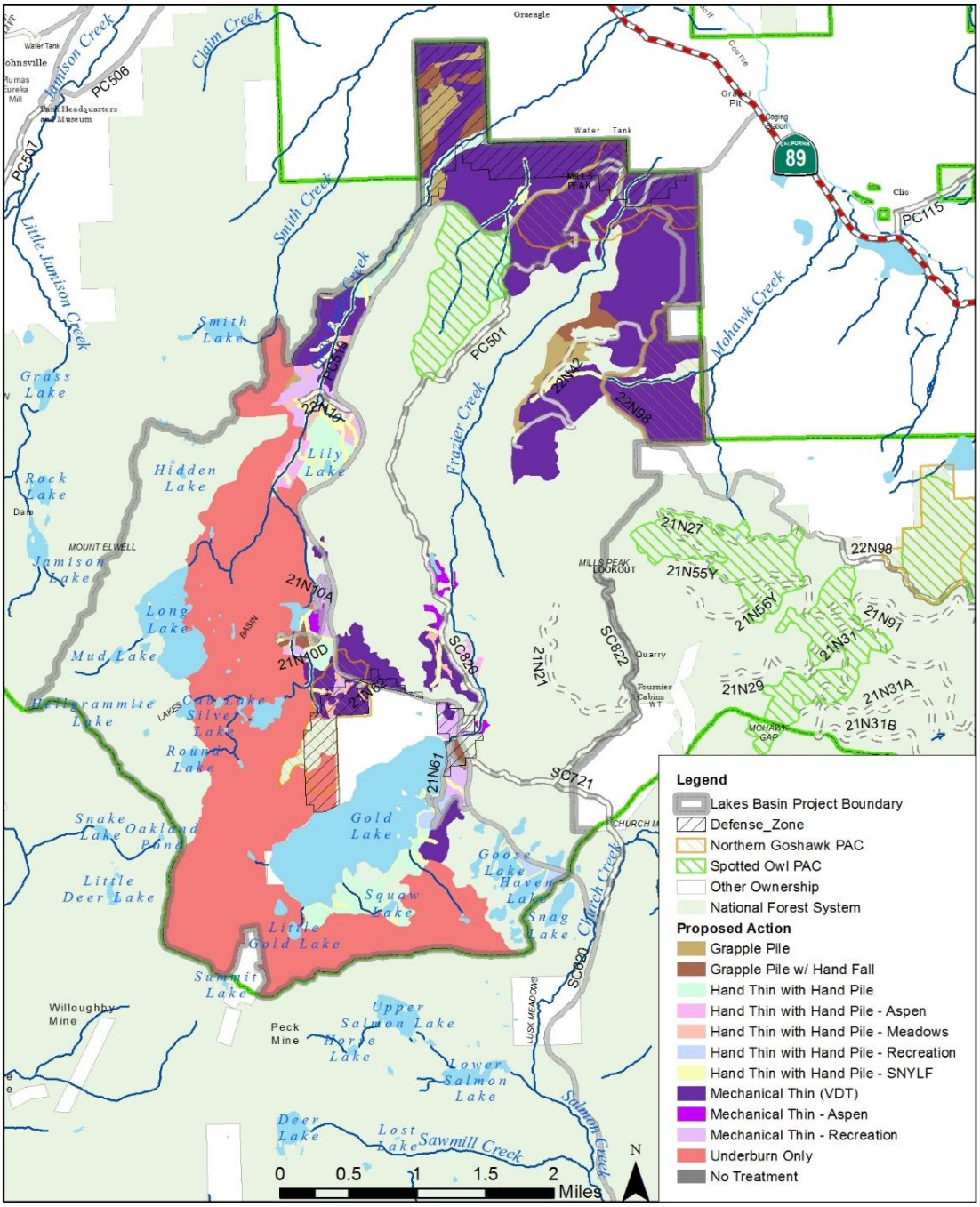

Figure 14. Lakes Basin Project Alternative 1 Proposed Treatments - Original

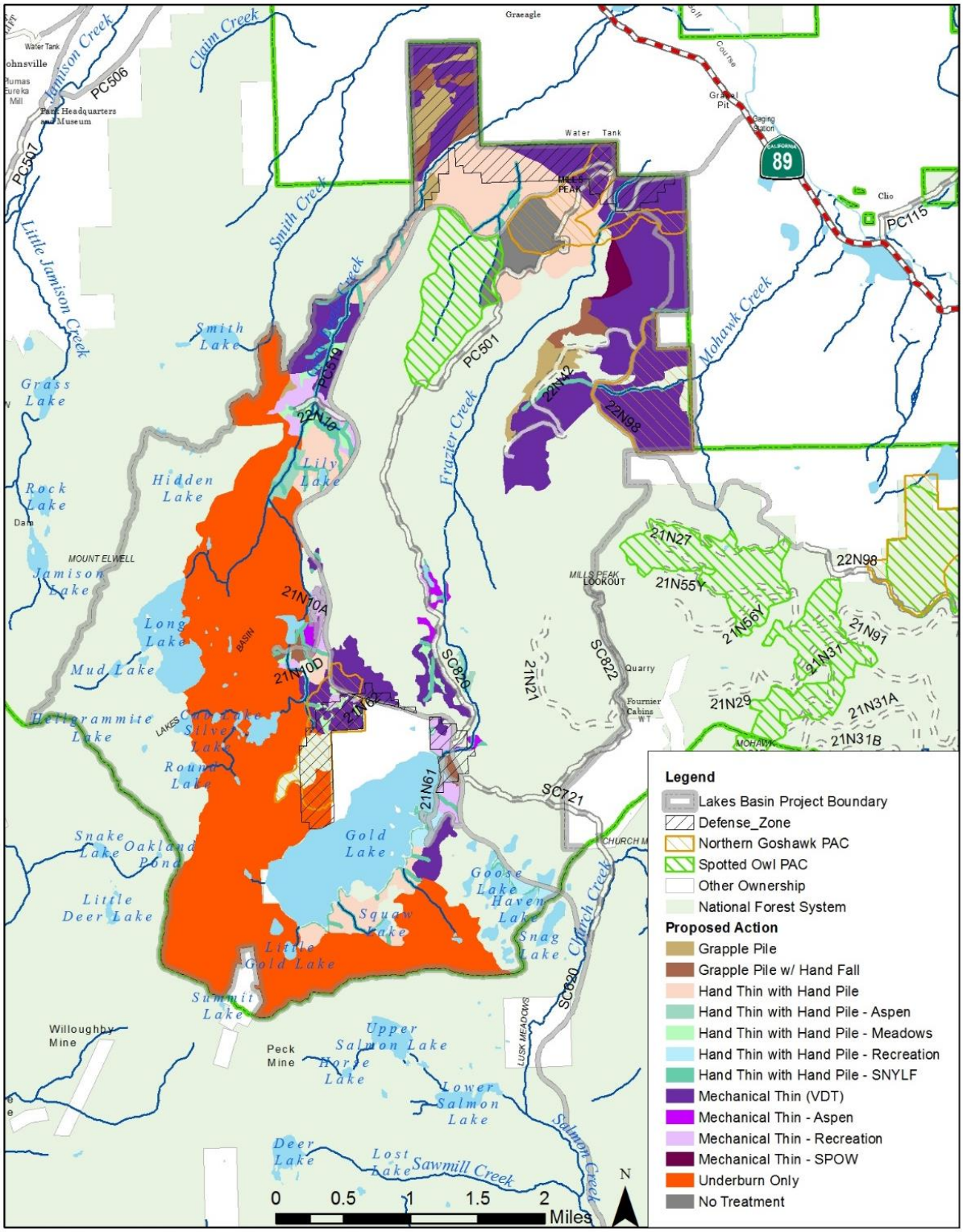

Figure 15. Lakes Basin Project Alternative 2 Proposed Treatments

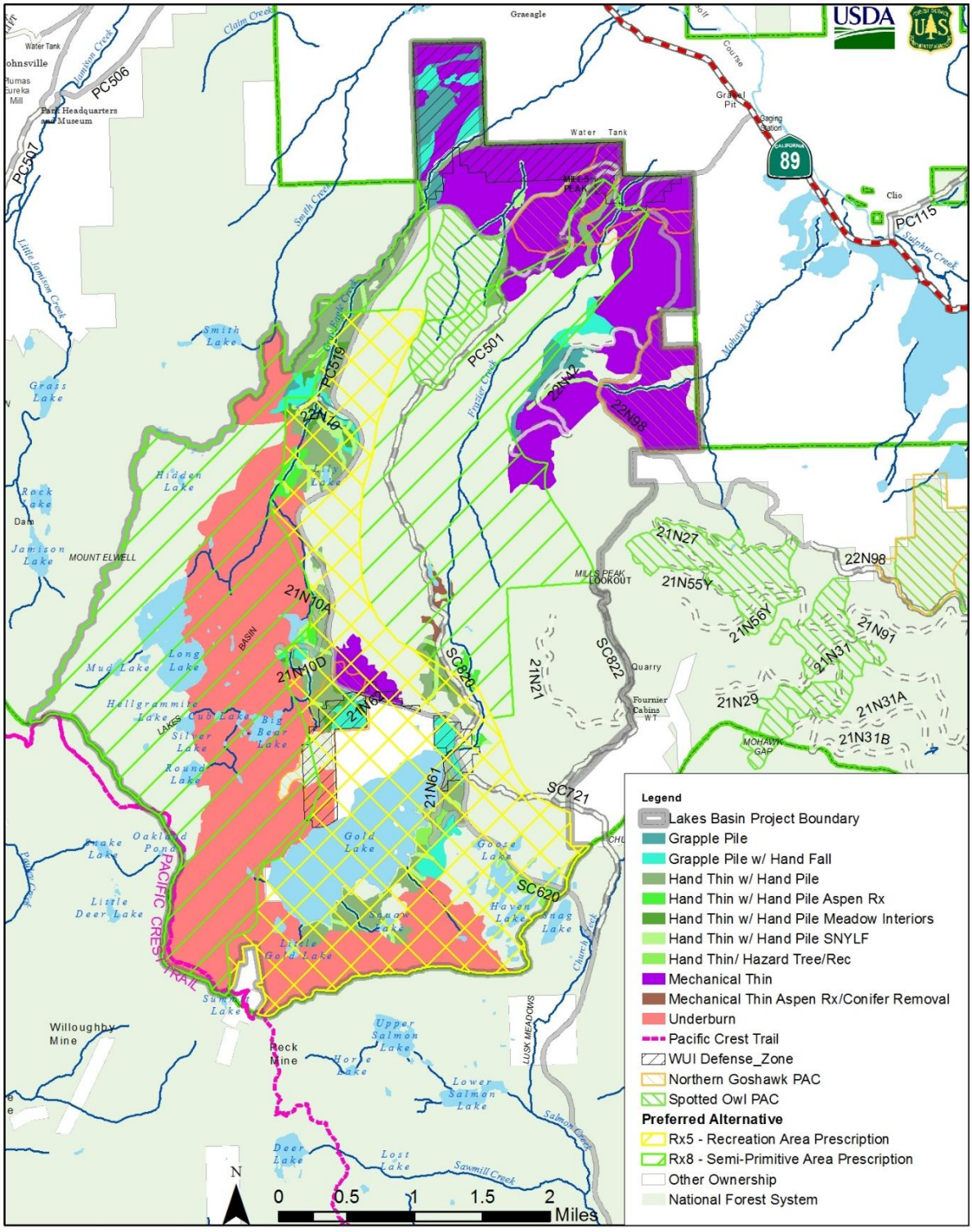

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Figure 16. Lakes Basin Project Alternative 1 Proposed Treatments - Updated

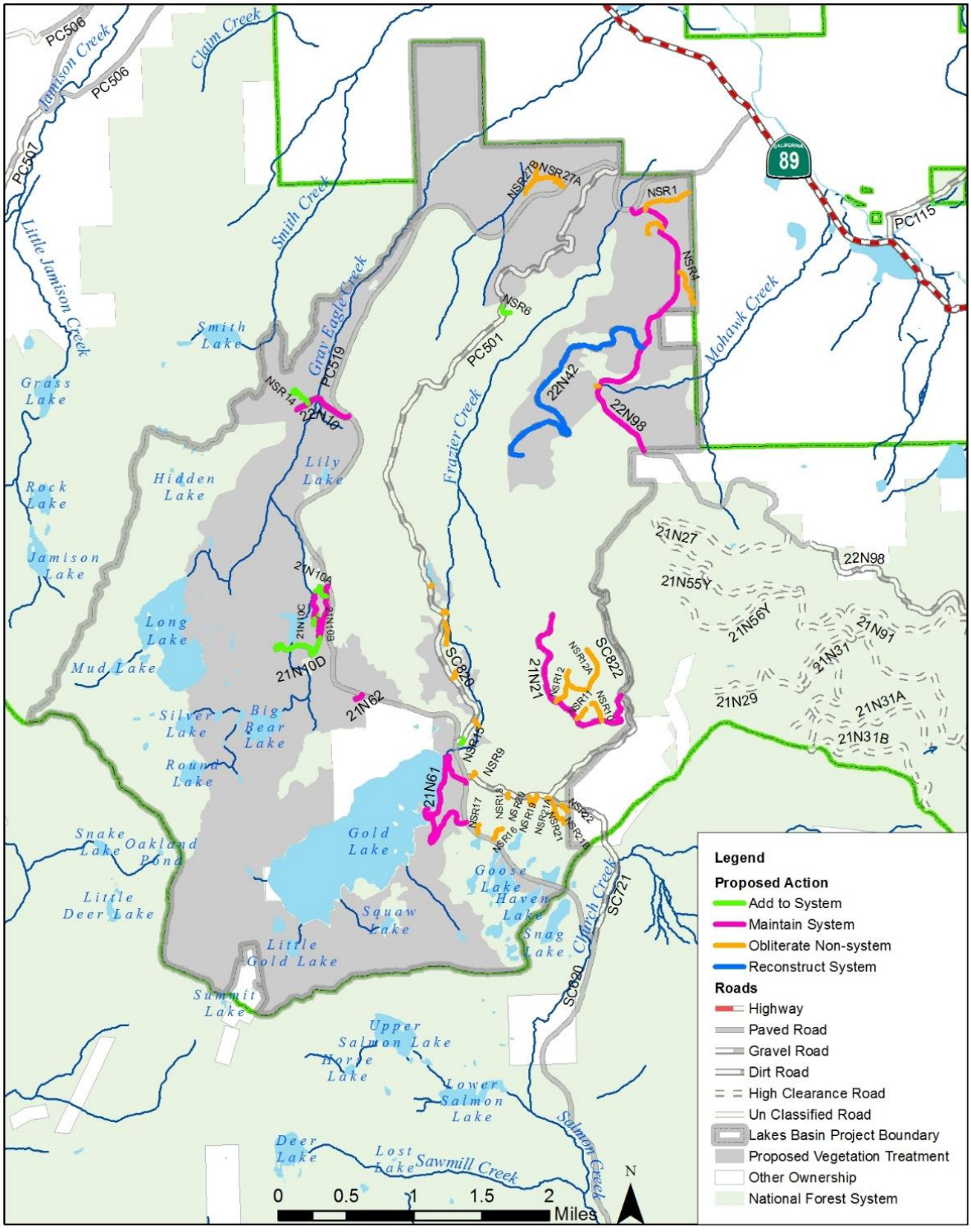

Figure 17. Lakes Basin Project Proposed Road Actions

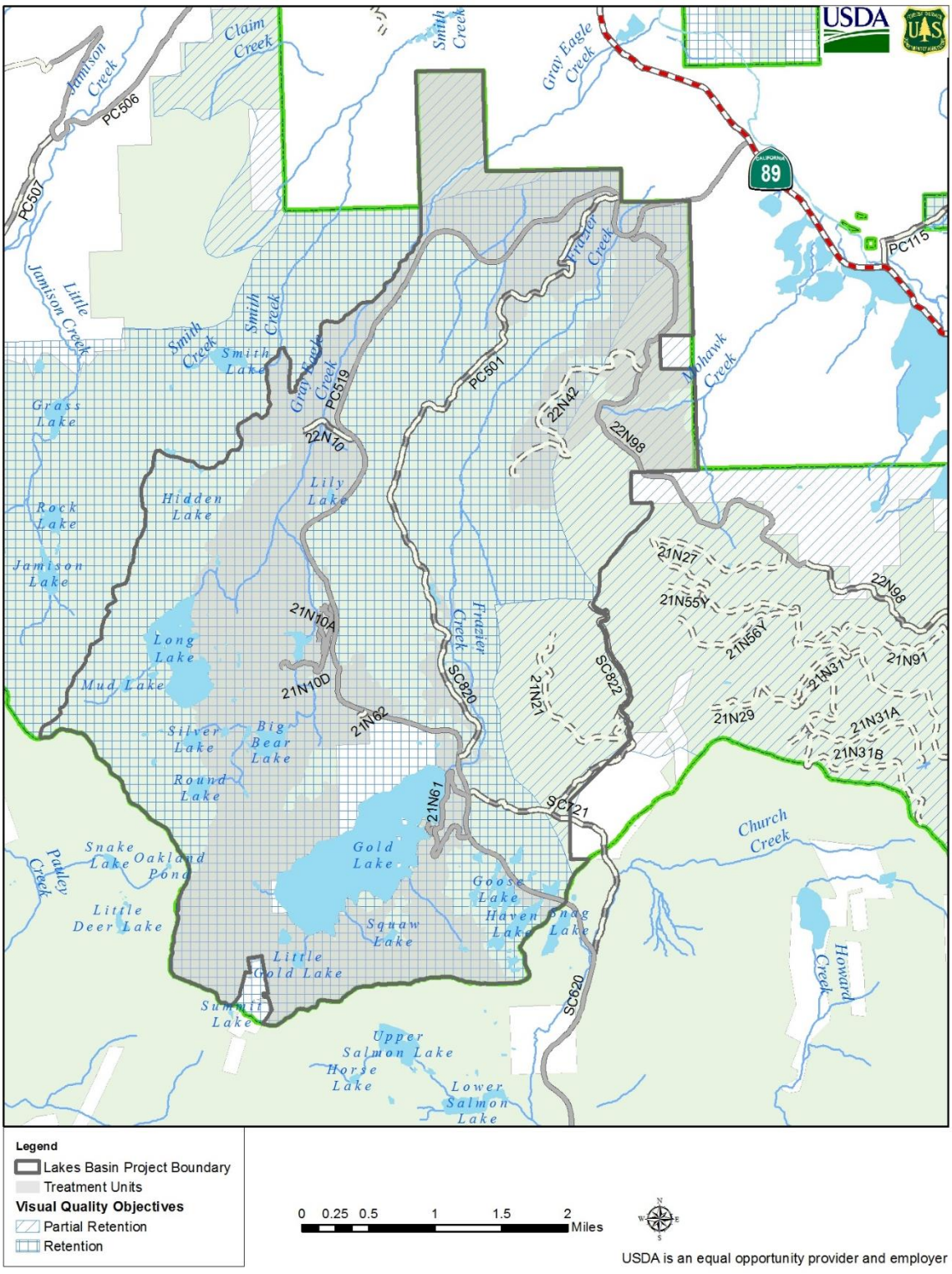

Figure 18. Map showing Visual Quality Objectives of Retention and Partial Retention and Treatment Units for Lakes Basin Project Area

Appendix C - Past, Present, and Reasonably Foreseeable Future Projects

Table 74. List of Present and Future Foreseeable Projects within the Lakes Basin Project Area and Extended Boundary

Project Name	Year	Location	Treatment Type	Comments
Lakes Basin Project Area				
Present and Future-Foreseeable Projects				
Fuelwood Gathering	Ongoing	Outside of LBRA only	There were 128 commercial woodcutting permits for 925 cords of wood and 702 personal woodwoodcutting permits for 2,095 cords of wood issued on the Beckworuth Ranger District In 2016.	Cord wood consists of dead trees and down logs within the forest, along forest roads, and within cull decks created by past logging operations, or as standing snags. Future quantities are estimated to be similar to those of 2016.
Christmas Tree Cutting Program	Ongoing	Outside of LBRA only	There were 3,394 permits issued on the Beckwourth Ranger Distict in 2016.	This consists of the trees ≤ 6 inches in diameter (measured at the ground) being removed generally along or within a short distance from open roads.
Recreation	Ongoing	Forest-wide		Camping, bicycling, hunting, fishing, hiking, mining and OHV use.
Commercial Lodging	Ongoing	Occupies approx. 11 acres in the LBRA	Maintenance of infrastructure, may include removal of hazard trees	Gray Eagle Lodge, Gold Lake Lodge, Elwell Lodge
Mills Peak Trail South	2018	Approx. 2 miles of trail outside of LBRA	Trail Repair and Construction	Project includes improving existing trail and constuction of some new trail.
Mills Peak Trail North	2017 - 18	Approx. 4 miles of trail outside of LBRA; north of Mills Peak	Trail Repair and Construction	New trail for non-motorized use only, currently under construction, in treatment units 414, 419, and 420.
Gold Lake 4 x 4 Campground Pit Toilet Replacement	2018	Campground at west end of Gold Lake on NFS road 21N93	Install new toilets.	
Gold Lake Highway Improvement Project	Undetermined	Gold Lake Highway; Approx. 11 miles	Proposed Highway Improvement	Plumas and Sierra Counties Roads Deptartments; Road resurfacing and guardrail replacement.
Mills Placer Mine	Ongoing	NFS road 21N21; one mile south of Mills Peak	Placer Minining Operation	

Extended Boundary				
Present and Future Foreseeable Projects				
Plumas Eureka Project	2019	North and East of Plumas Eureka State Park; 2835 acres	Commercial timber harvest, fuels reduction.	Currently in planning stages; year of implementation may change.
Haskell Project	2020	West of Lakes Basin Project Area; 9100 acres	Commercial timber harvest, fuels reduction.	Currently in planning stages; year of implementation may change.
Yuba Project	2018	Northeast of Sierra City, CA; 14,545 acres	Hazardous Fuels Reduction and CommercialTimber Harvest	On Tahoe National Forest adjacent to the Lakes Basin Project area.
Mt Haskell Grazing Allotment	Ongoing	East of Lakes Basin Project Area; 3416 acres	Sheep grazing.	
Gold Valley Grazing Allotment	Ongoing	Adjacent to LBRA; 11,741 acres	Cattle grazing.	On Tahoe National Forest
Howard Creek Grazing Allotment	Ongoing	Adjacent to LBRA; 10,046 acres	Sheep grazing.	On Tahoe National Forest
Haskell Peak Grazing Allotment	Currently vacant	Adjacent to LBRA; 3,228 acres	Cattle grazing.	On Tahoe National Forest.
Timber Harvest Plan (THP #71). Soper Co.	Active	Outside of LBRA only	Timber harvest	Treatments include: Group Selection, Sanitation Salvage, Commercial Thinning,
Fuelwood Gathering	Ongoing	Outside of LBRA only	There were 128 commercial woodcutting permits for 925 cords of wood and 702 personal woodwoodcutting permits for 2,095 cords of wood on the Beckwourth Ranger Distict in 2016.	No Hardwood Removal on Beckwourth Ranger District. Cord wood consists of dead trees and down logs within the forest, along forest roads, and within cull decks created by past logging operations, or as standing snags.
Christmas Tree Cutting Program	Ongoing	Outside of LBRA only	There were 3,394 permits issued on the Beckwourth Ranger Distict in 2016.	This consists of the trees ≤ 6 inches in diameter (measured at the ground) being removed generally along or within a short distance from open roads.
Recreation	Ongoing	Forest-wide		Camping, bicycling, hunting, fishing, hiking, mining and OHV use.

Appendix D – Standard Management Requirements

The following Standard Management Requirements (SMRs) apply unless specifically allowed for in the environmental analysis.

Fire/Air Quality

Table 75. Design criteria for fire and air quality.

Criterion	Actions
Compliance with Air Quality	Comply with air quality permits issued by the Northern Sierra Air Quality Management District for all prescribed burning. A prescribed burn plan, including a mandatory smoke management plan (SMP), would be required prior to any prescribed fire. The SMP is reviewed and approved by the local Air Quality Management District office.
Smoke Management	Conduct prescribed burning in a manner that limits excessive buildup of smoke in any particular air shed or smoke sensitive area**.**
Tree Mortality	No more than 10 percent variable amounts of mortality may occur in the residual forest stands following underburning. Pockets of mortality within forested stands shall not exceed 2 acres. Minimize mortality in visual corridors.

Watershed

Protect water quality through the use of Best Management Practices (BMPs) which are employed by the Forest Service and the State of California to prevent water quality degradation and to meet state water quality objectives relating to non-point sources of pollution (Hydrology and Soils Report). In addition, use site-specific mitigation measures that relate directly to these BMPs to minimize erosion and resultant sedimentation. Apply the standards and guidelines identified in the 2004 Sierra Nevada Forest Plan Amendment (SNFPA) Record of Decision (ROD) relating to treatment of fuels and associated project activities in all Riparian Conservation Areas (RCAs) and Streamside Management Zones (SMZ) unless specifically allowed for in the environmental analysis.

Riparian Conservation Area and Streamside Management Zone

Integral to the protection of streamside management zones and riparian conservation areas is the designation of prescribed widths for these zones, so that the location of special treatment design features associated with SMZs and RCAs is clear to all persons involved in carrying out a proposed project. Guidelines for widths of SMZs are presented in Appendix M of the PNF LRMP. These guidelines were superseded by the suggested widths for Riparian Conservation Areas (RCAs) presented in Appendix A of the 2004 Record of Decision (ROD) for the regional amendment of Forest Plans within the Sierra Nevada. The RCA widths listed below (Table 76) are maximum buffer width identified for each feature type (USDA 20014). Project specific exclusion

zones for activities within these RCAs would be included in the mitigation measures section of the Water and Soil Resource Effects Assessment report.

Table 76. Design criteria for Riparian conservation areas by feature type (USDA 2004).

Feature Type	Riparian Conservation Area Width (Feet)
Perennial Streams	300 feet on each side of the stream, measured from bank full edge of the stream
Seasonally Flowing Streams (includes intermittent and ephemeral streams)	150 feet on each side of the stream, measured from the bank full edge of the stream
Streams in Inner Gorge[1]	Top of inner gorge
Special Aquatic Features[2] or Perennial Streams with Riparian Conditions extending more than 150 feet from edge of streambank or Seasonally Flowing streams with riparian conditions extending more than 50 feet from edge of streambank	300' from edge of feature or riparian vegetation, whichever is greater
Other hydrological or topographic depressions without a defined channel	RCA width and protection measures determined through project level analysis

Table 77. Design criteria for riparian conservation areas.

Criterion	Actions
RCA Equipment Constraints	Establish equipment exclusion zones adjacent to stream channels according mitigation measures in the Water and Soil Resource Effects Assessment report. Allow equipment to travel into outer RCA zone to harvest trees and bring them to skid trails. To minimize soil displacement, no equipment would be permitted to turn around while off a skid trail in RCA.
Special Aquatic Features[3]	Prohibit mechanical equipment use and precribed burning activities including pile burning within these features in accordance with mitigation measures in the Water and Soil Resource Effects Assessment report. Tree boles would be left in fens as benefit to structure and diversity.
Landings	There would be no construction of new landings or use of old landings within RCAs unless agreed to by earth scientist and sale administrator.

[1] Inner gorge is defined by stream adjacent slopes greater than 70 percent gradient.
[2] Special Aquatic Features include: lakes, meadows, bogs, fens, wetlands, vernal pools, and springs.
[3] Special Aquatic Features include: lakes, meadows, bogs, fens, wetlands, vernal pools, and springs.

Temp roads/ Skid trails	Where temporary road or skid trail construction involves cut and fill, the feature would be subsoiled, then re-contoured to match the existing topography. Maintain adequate cover of surface fuels, litter, duff, and large woody debris to maintain ground cover based upon the recommendation from the Forest Plan standards and guidelines Erosion Hazard Ratings (EHRs). These areas would be sufficiently blocked at the entrances to preclude access by motorized wheeled vehicles. Where temporary roads cross stream channels, all fill would be removed from the channel and utilized for re-contouring or spread in a stable location outside the RCA. To the extent possible, existing skid trails would be utilized thus minimizing any new disturbance within the project area.
Stream Crossings	Crossings of perennial streams with skid trails or temp roads are generally prohibited. If skid trails or temporary road construction is necessary for perennial or intermittent are needed consultation with earth scientist and biologist is required prior to approval.
Prescribed Fire and Burn Piles	Broadcast (prescribed) burning and burn pile loctions would be allowed within RCAs in accordance with mitigation measures identified in the Water and Soil Resource Effects Assessment report.

Several soil and water quality protection measures are standard for timber harvest projects on NFS lands. Most of these measures, such as practices for stream course protection, harvest traffic patterns and skid trail layout, are described in the Timber Sale Administration Handbook for Region 5 (FSH 2409.15) and in standard clauses of timber sale contracts.

Table 78. Design criteria for hydrology and soil resources.

Criterion	Actions
Temporary Roads	All temporary roads used in this project whether existing or new would be closed to traffic and adequate drainage installed after operations. Subsoiling is required (see subsoiling project design criteria, below)
Subsoiling (Landings, temp roads, main skids)	All landings, all temp roads, and main skids within 200 feet of landings would be subsoiled. If implemented, subsoiling would lift and fracture the soil in place leaving it loose and friable to a minimum depth of 18 inches. Treatment would be repeated if furrows are left deeper than 12 inches. Furrows would be oriented perpendicular to slopes greater than 10%. Subsoiling treatments could be suspended or eliminated if the subsurface rock size and distribution is such that effective operation is not possible, if slopes are over 25%, or if root damage or root disease, is a concern. The contract (sale) administrator shall consult with earth scientist and other appropriate resource specialists to eliminate or suspend subsoiling.

Prescribed fire control line construction	Fire control lines are a concern for hydrology and soil quality risks, whether put in by hand or using mechanical means. They need to be rehabilitated for drainage using best management practice (BMP) guidance. Where containment lines meet roads or off highway vehicle (OHV) trails they shall be disguised by scattering brush and slash for the first 100 feet. In the first 100 feet from an existing road or trail, fire containment lines shall not be constructed until implementation is scheduled. If prescribed fire containment lines are in riparian conservation areas (RCA's) they shall also be covered with slash to achieve 50% ground cover. Fireline construction should be in accordance with all equipment restrictions. Exception may be made upon consultation with an earth scientist. If old road templates are opened up they are to be physically closed with rock or earthen barriers. The objective is for them to not become non-system trails.
Slope Restrictions	Ground-based equipment would be restricted to slopes less than 35 percent. Exceptions may be made for short pitches of 100 feet slope distance, up to 50% slope. When units have inaccessibly steep inclusions of steeper ground, sawlog and biomass products may be end-lined. Excessive soil displacement (i.e., 'furrowing') caused by endlining would be mitigated or repaired by the operator. Mastication and grapple piling units may include 40% slope. Exceptions may be made for short pitches of 100 feet slope distance, up to 50% slope.
Wet weather and winter harvest operations	Conduct ground based harvest operations when soil is dry; that is, in the spring when soil moisture in the upper 8 inches is not sufficient to allow a soil sample to be squeezed and hold its shape, or will crumble when the hand is tapped. In the summer and early fall after storm event(s) when soil moisture between 2-8 inches in depth is not sufficient to allow a soil sample to be squeezed and hold its shape, or will crumble when the hand is tapped. Winter harvest operations may occur only when the ground is frozen to a depth of 5 inches, has at least 18 inches of snow, or is compacted by equipment to 8 inches.
Ground Cover Retention and Down Woody Material	Maintain adequate cover of surface fuels, litter, duff, and large woody debris to maintain ground cover based upon the recommendation from the Forest Plan standards and guidelines Erosion Hazard Ratings (EHRs). Maintain, where available, 10-15 tons of large down logs per acre (greater than 12 inches diameter), emphasize decay classes 1, 2, and 3. On site activity generated material (slash or chips) shall not exceed a depth greater than 6 inches in depth.
Equipment use	Only grapple piling equipment with lift capabilities would be utilized for machine piling. Dozer piling would be avoided unless absolutely necessary, and would be allowed in landings.

Project Best Management Practices (BMPs)

Best management practices utilized on Plumas National Forest System (NFS) lands are procedures and techniques that are incorporated in project actions and have been determined by the State of California to be the most effective, practicable means of preventing or reducing the amount of pollution generated by nonpoint sources to a level compatible with water quality goals. BMPs applicable to PNF projects are presented in a guide for all U.S. National Forests,

National Best Management Practices for Water Quality Management on National Forest System (USDA 2012b).

Activities would have BMP implementation monitoring using a "checklist" approach. BMP implementation checklists would document whether and when the site-specific BMPs specified in NEPA analyses were implemented. These checklists would provide a systematic means for early detection of potential water-quality problems, and would be completed early enough to allow corrective actions to be taken, if needed, prior to any significant rainfall or snowmelt throughout the duration of the project. Checklists would be completed several times during the life of most projects, including prior to ground-disturbing activities, prior to winter periods, and at the completion of the project.

Table 79. Prominent National BMPs applicable to Timber activities

National Best Management Practices	
Mechanical Vegetation Management Activities	
Veg-1	Vegetation Management Planning
Veg-2	Erosion Prevention and Control
Veg-3	Aquatic Management Zones
Veg-4	Ground-Based Skidding and Yarding Operations
Veg-6	Landings
Veg-7	Winter Logging
Veg-8	Mechanical Site Treatment
Road Management Activities	
Road-1	Travel Management Planning and Analysis
Road-2	Road Location and Design
Road-3	Road Construction and Reconstruction
Road-4	Road Operations and Maintenance
Road-5	Temporary Roads
Road-6	Road Storage and Decommissioning
Road-7	Stream Crossings
Road-8	Snow Removal and Storage
Road-9	Parking and Staging Areas
Road-10	Equipment Refueling and Servicing
Road-11	Road Storm-Damage Surveys
Water Use Management Activities	
WatUses-1	Water Use Planning
WatUses-3	Administrative Water Developments
Aquatic Ecosystems Management Activities	
AqEco-1	Aquatic Ecosystems Improvement and Restoration Planning
AqEco-2	Operations in Aquatic Ecosystems
AqEco-3	Pond and Wetlands
AqEco-4	Stream Channels and Shorelines
Wildland Fire Management Activities	
Fire-1	Wildland Fire Management Planning
Fire-2	Use of Prescribed Fire
Chemical Use Management Activities	
Chem-1	Chemical Use Planning
Chem-2	Follow Label Directions
Chem-3	Chemical Use Near Waterbodies
Chem-4	Chemical Use in Waterbodies
Chem-5	Chemical Handling and Disposal
Chem-6	Chemical Application Monitoring and Evaluation

Aspen and Cottonwood Treatment

Table 80. Design criteria for aspen and cottonwood stands.

Criterion	Actions
Mechanical equipment use in RCAs	Project specific equipment exclusion zones would be included in the mitigation measures section of the Water and Soil Resource Effects Assessment report . Mechanical equipment will be allowed to work adjacent to this exclusion zone and reach in with an extendable boom.
Skid trail location	Skid trails will be perpendicular to the stream course within 50 feet of the stream and spacing of skids will be no closer than 120 feet.
Streambank stability	No trees will be removed that are providing stability to the streambank.
Harvesting periods	These units will be harvested in dry periods when the upper 8 inches of the soil is essentially dry. For this measure soil is defined as “dry” when no portion can be molded by hand compression and hold that shape when the hand is tapped. Additionally, these units can be treated when the ground is frozen to a depth of 5 inches or snow depth is at least 18 inches or is snow is compacted by equipment to 8 inches.

Transportation

Table 81. Design criteria for transportation.

Criterion	Actions
Stream crossings	Design all new stream crossings to accommodate a 100-year flood and provide fish passage as necessary.
Water bars	Stabilize and strategically place water bars on temporary roads where drainage control issues are evident or expected.
Dust abatement	Abate dust from logging traffic with water selected from water drafting sites that have suitable stream flow and access. When water is scarce, use alternative sources such as chlorite, sulfonate or other dust abatement materials.
Drafting sites	New or existing water draft sites would be evaluated with the District Wildlife Biologist prior to changes or use. Drafting sites shall be visually surveyed for amphibians and their eggs before drafting begins. Estimate maximum drawdown volumes prior to using the draft site. Maintain minimum pool levels during drafting using measurements such as staff gauges, stadia rods, tape measures, etc. Construct water-drafting sites so that oil, diesel fuel, or other spilled pollutants would not enter the stream. Back down ramps would be constructed and or maintained to ensure the streambank stability is maintained and sedimentation is minimized. Rocking, chipping, mulching, or other effective methods are highly recommended to achieve this objective. As necessary, earthen or log berm, straw waffle, certified hay or rice straw bale berms, or other containment structures would be constructed at the bank full water line to protect the stream bank.

	Forest personnel and contractors shall use the Forest Service approved suction strainer (FSM 5161) or other foot vales with screens having openings less than 2mm in size at the end of drafting hoses. The suction strainer shall be inserted close to the substrate in the deepest water available; the suction strainer shall be placed on a shovel, over plastic sheeting, or in a canvas bucket to avoid uptake of substrate or aquatic biota. “Mucked out” debris, bedload sediment, etc. shall be transported to an appropriate disposal site (to be designated) if no apparent site is feasible.
Pre-existing skid trails and landings	Whenever available, feasible, and in a desirable location, use pre-existing skid trails and landings. In order to avoid loss of land base productivity, no more than 15 percent of timber stands would be dedicated to landings and permanent skid trails (USDA, 1988a). In areas where pre-existing skid trails and landings are not present, construction of such facilities would occur as agreed upon by the Forest Service and purchaser. All landings and skid trails utilized would conform to the standards and guidelines set forth in the Timber Sale Administration Handbook (FSH 2409.15) and the Forest Plan.

Visual Quality Management (Immediate Foreground of Visual Corridors)

Table 82. Design criteria for visual quality management.

Criterion	Actions
Landings and skid trail locations	To the extent feasible, locate landings and primary skid trails away from the immediate foreground of Sensitivity Level I and II travel corridors. Limit size of landings so that they are not visually evident from the sensitive travel routes following completion of treatment activities.
Burn piles and underburning	Target consumption of burn piles to 90 percent or greater. Target underburn mortality levels of crop trees to 10 percent or less. Consider chipping piles that are within 100’ recreation sites, such as campgrounds or trailheads.
Recreation access road and parking lot surfacing	Utilize durable crossing materials such as steel plates to avoid damaging road or parking lot surfacing (asphalt, concrete, etc.) by heavy equipment. Repair any damage caused to surface to original condition.

Silviculture

Table 83. Design criteria for vegetation and fuels management

Criterion	Actions
Snag retention	Retain the number of snags per acre appropriate for each forest type unless removal is required to allow for operability. In Sierra mixed conifer types, ponderosa pine, and westside hardwood forest types, retain 4 of the largest snags per acre; in the red fir forest type, retain 6 of the largest snags per acra; in the eastside pine type, retain 3 of the largest snags per acre in the eastside and eastside pine types. Snags larger than 15 inches DBH and 20 feet in height would be used to meet this guideline.
Root disease prevention measures	Conifer stumps 14 inches and greater in diameter would be treated with a registered borate within eight hours, to prevent the introduction and spread of *Heterobasidion* root disease. Within Recreation Areas, apply borate compound within 4 hours to all pine and true fir cut stumps greater than 3 inches in diameter.
Structure trees	Retain and protect high value wildlife habitat trees (trees with multiple tops, broken tops, rot, cavities, and other formations) that create structure for wildlife nests and dens.
Residual species preference	Where present, retain all hardwood and riparian species. Retain the largest, most vigorous dominant and co-dominant trees to create a residual stand that would be comprised of larger fire-resilient trees. Species preference would be determined by dominant forest type. In general, prefer to retain shade-intolerant species including rust-resistant sugar pine, black oak, ponderosa and Jeffery pine, and Douglas fir.
Biomass treatment for fuels	Preferably, all biomass material will be taken to the landing and disposed of. If no viable biomass market exists, another option would be for material to be left within the stand in small machine piles (grapple piling treatment) or hand constructed piles. This design feature is intended to leave smaller amounts of fuels distributed across the landscape so that follow up disposal (burning) is easier.
Prescribed fireline construction (machine)	In general, prescribed fireline construction utilizing a piece of equipment would be conducted in accordance with district resource specialists.
Motorized and non-motorized trails	Motorized and non-motorized trails will be protected from damage as much as possible and shall be restored back to its original condition if damaged by operations. These trails are to be closed to the public during active operations that utilize these trails. Trails will be signed during these closures. The Forest Service timber sale administrator will be notified by the sale operator 15 days prior to entering the units that the trails are included in or adjacent to. Closure will be by mutual agreement as to timing, duration and type and location of safety signs. No decking of landing piles on trails. Trails are to remain open after they have been utilized for project purposes.

Botanical Resources

Protect known Threatened, Endangered, Sensitive and Special Interest plant species according to Plumas National Forest current interim management prescriptions for specific species. If

additional protected plant species are found during the life of the project, conduct an assessment and apply appropriate management prescriptions.

Noxious Weeds

Standard management requirements (SMRs) were developed in accordance with the direction set forth in FSM 2900 as well as standards and guidelines in Appendix A of the ROD for SNFPA:

Table 84. Design criteria for management of invasive plants

Criterion	Actions
Cleaning road equipment	Require all off-road equipment and vehicles (Forest Service and contracted) used for project implementation to be free of weeds. Clean all equipment and vehicles of all mud, dirt, and plant parts. This will be done at a vehicle washing station or steam-cleaning facility before the equipment and vehicles enter the project area.
Staging areas	Do not stage equipment, materials, or crews in areas infested with invasive plant species where there is a risk of spread to areas of low infestation.
Control areas	Designated Control Areas are locations where equipment and soil-disturbing project activities would be excluded. This area will be identified on project maps and delineated in the field with day-glow orange noxious weed flagging.
Road construction, reconstruction and maintenance	All earth-moving equipment, gravel, fill, or other materials need to be weed free. Onsite sand, gravel, rock, or organic matter would be used where possible.
Revegetation	If skid trails, landings, or stream crossings require soil stabilization, weed-free equipment, mulches, and seed sources would be used. On-site material would be chipped to use as mulch to the extent possible. If mulch is imported to the site use weed free rice straw (preferred) or certified weed free straw. Avoid seeding in areas where revegetation will occur naturally, unless invasive plant species are a concern. Save topsoil from disturbance and put it back to use in onsite revegetation, unless contaminated with invasive plants. All activities that require seeding or planting would need to use locally collected native seed sources or those identified by the Botanist. A seed mix would be developed when specific site locations and conditions (dry, moist, wet, etc) are determined.

Cultural Resources

As outlined in the Programmatic Agreement (PA), the following protection measures will be implemented, as appropriate, for all cultural resources located within the project area. The application of the following protection measures would result in the project having “no effect” on cultural resources and the Forest would have taken into account the effect of the project on cultural resource sites in compliance with the PA and Section 106 of the NHPA.

If any unrecorded cultural resources (artifacts, features or sites) are encountered as a result of project operations, all activities in the vicinity of such finds will immediately cease pending an examination by the Forest or District Archaeologist.

- At a minimum, artifacts and features shall be avoided where activities associated with the project will occur.
- All proposed undertakings shall avoid effects to cultural resource sites. Avoidance means that no activities associated with the project that may affect cultural resource sites, unless specifically identified in the Programmatic Agreement, shall occur within a site's boundaries, including any defined buffer zones. Portions of the undertaking may need to be modified, redesigned, or eliminated to avoid cultural resource sites.
- Buffer zones may be established to ensure added protection where the Forest or District Archaeologist determines that they are necessary. The use of buffer zones may be applicable where setting contributes to the property's eligibility under 36 CFR 60.4, or where it may be an important attribute of some types of cultural resource sites (e.g., historic buildings or structures with associated historic landscapes; or traditional cultural properties important to Native Americans), or where heavy equipment is used in proximity to cultural resources. The size of buffer zones shall be determined by the Forest or District Archaeologist on a case-by-case basis.
- All known cultural resource sites within the project area of potential effect (APE) shall be clearly delineated prior to implementing any associated activities that have the potential to affect cultural resource sites.
- When any changes in proposed activities are necessary to avoid cultural resources (e.g., project modifications, redesign, or elimination; removing old or confusing project markings or engineering stakes within site boundaries; or revising maps or changing specifications), these changes shall be completed prior to initiating any project activities.
- Monitoring by heritage program specialists may be used to enhance the effectiveness of protection measures.
- Upon approval of the Forest or District Archaeologist, low-intensity underburning may be allowed within selected cultural resource sites as long as fuel loads are relatively light and values at risk are protected.
- The Forest or District Archaeologist may approve the use of mechanical equipment to remove brush or woody material from within specifically identified areas within site boundaries under prescribed measures designed to prevent or minimize effects. Vegetative or other protective padding may be used in conjunction with the Forest or District Archeologist authorization of certain equipment types within site boundaries.
- Mechanically treated (crushed/cut) brush or downed woody material may be removed from cultural resource sites by hand, through the use of off-site equipment, or by rubber-tired equipment approved by the Forest or District Archaeologist.

- Woody material may be chipped within the boundaries of cultural resource sites so long as the staging of chipping equipment on-site does not affect cultural resources and staging areas are specifically approved by the Forest or District Archaeologist.
- Vegetation may be removed within cultural resource sites using hand tools, so long as ground disturbance is minimized and features are avoided. The removed vegetation shall not be piled within site boundaries unless the location has been specifically approved by the Forest or District Archaeologist.
- Activities may be implemented over snow cover on cultural resource sites under the following conditions: The cover must have at least 12 inches depth of compacted snow or ice throughout the duration of activities on sites. And all concentrated work areas (e.g., landings, skid trails, turnarounds, and processing equipment sites) shall be located prior to snow accumulation and outside cultural resource site boundaries.
- Roads proposed to be decommissioned that extend through cultural resource sites would need to be passively closed in a way that would not affect cultural resources such as blocking the road with barriers.

Wildlife

Protect habitat for known Threatened, Endangered, Sensitive and Special Interest terrestrial and aquatic wildlife species in accordance with the Forest Plan as amended by the Sierra Nevada Framework ROD. If additional species are found during the life of the project, conduct an assessment and apply appropriate management prescriptions.

Table 85. Design criteria for terrestrial and aquatic wildlife

Criterion	Actions
Wildlife limited operating periods	Limited operating periods (LOPs) would be applied to protect key wildlife species listed in the 2004 SNFPA ROD (pages 54-62) and the Biological Evaluation/Biological Assessment unless the District Biologist determines the LOPs to be unnecessary following pre-implementation surveys,
New wildlife findings	Where subsequent surveys identify occupied threatened, endangered, or sensitive species habitat, establish Protected Activity Centers (PACs), den site buffers, or other protections as described in the SNFPA ROD. Include protections for any additional sensitive species identified in the BE/BA. In the event of a verified TES species occurrence after project award, the appropriate LOPs would apply. Other mitigations may take place as agreed upon by the District Wildlife Biologist and Sale Administrator.
Wildlife trees	Retain trees that are 20 inches DBH or greater and provide structure beneficial for wildlife use. Suitable trees can be identified by certain desirable characteristics such as teakettle branches, large diameter broken tops, and large cavities located within the tree's bole.
Down wood	Within westside vegetation types, generally retain an average of 10-15 tons (> 15 inch diameter) of large down wood per acre over the treatment unit. Within eastside vegetation types, an average of 3 large down logs would generally be retained per acre. In areas

	considered deficient in large woody debris, wherever possible leave cull logs at the stump rather than being skidded to the landing. The Sale Administrator and the District Wildlife Biologist would agree upon the location and amount of down wood to be retained (Table 2, SNPA 2004 ROD).
Snags	Snag retention levels would be determined on an individual, project basis; however, they would consider the guidelines set forth in the Standards and Guides (USDA 2004). The Guidelines state that projects would retain 4 of the largest snags per acre in westside mixed conifer and ponderosa pine types; 6 of the largest snags per acre in the red fir forest type; 3 of the largest snags per acre in the eastside and eastside pine types; and 4 of the largest snags in westside hardwood ecosystems. Wherever possible, use snags larger than 15 inches DBH to meet these guidelines (Table 2, SNPA 2004 ROD).

Mining

Table 86. Design criteria for mining claims

Criterion	Actions
Protect mining claim corner markers and discovery markers	Mining claims markers include a corner monument on each of the four corners and one at the discovery point. Any other signs should be approved by the Forest Service and may require a Plan of Operations. Monuments are usually a wooden 4X4 post or a PVC pipe, often with rocks piled up around the base. However, a wide variety of variations can be found. This does not apply to signs attached to trees.
Claim signs attached to trees (marked for removal) should be removed from the tree and turned in to the Minerals staff	In most cases, attaching signs to trees is not allowed. However, many mining claims signs are attached to trees. If trees planned for removal have mining claim signs attached to them, the signs should be removed and turned in the Minerals staff, so the signs may be returned to the claimant. The location of the sign should be noted when turning it in to the Minerals staff.

Implementation

NEPA and Implementation: Within the project contract area, allow minor adjustments in boundaries of units if compatible with Forest Plan direction, the desired conditions, and anticipated environmental effects disclosed by the project's NEPA document.

Monitoring

Soils

The Forest Plan sets out objectives and protocol for monitoring of plan standards and guidelines, BMP compliance and effectiveness, and soil productivity parameters. Monitoring is to be completed by Forest staff on a per annum basis, either project by project, or a sampling of

projects. Sampling should include at least five units for effectiveness monitoring to confirm that soil cover and fine organic matter is not reduced below recommended levels. Road improvement and obliteration actions would be monitored after implementation and after the first winter to ensure that treatments remain effective. Specific methods would be defined by district watershed personnel.

Cultural Resources

Monitoring during project implementation, in conjunction with other measures, may be used to enhance the effectiveness of protection measures.

Wildlife

Monitoring prior to and during project implementation may be used to enhance the effectiveness of protection measures.

Invasive Species

Monitoring during and after project implementation would be used to assess the effectiveness of the SMRs and the control measures at preventing the introduction and spread of invasive plant species in the project area. The measurement indicators described in this analysis—for example, the number of existing infestations and the number of acres treated—would be used in this assessment. Post-treatment monitoring would identify the need for follow-up treatment, assess the effectiveness of the different treatment methods, and/or identify the need for alternative methods of control. Monitoring would be conducted by District personnel during and following project implementation and is expected to greatly reduce the likelihood of uncontrollable spread of invasive plant species in the project area.

Hydrology

Monitoring related to Forest Service Manual 2550 will be conducted. For example, to assure that adequate cover is retained in salvage logging units or to assure that enough Large Down Wood is retained.

Appendix E – Scoping Issues

Responses to scoping issues that did not drive an alternative are described below. The interdisciplinary team considered all scoping comments. The evaluation of the scoping comments is contained in the project record and is incorporated by reference.

Issue - Project should be analyzed as an EIS instead of EA

Two commenters suggested that the project should be analyzed as an environmental impact statement (EIS) as opposed to an EA. The first comment was that clear cutting and intensive logging along or near high-use roads and trails or near intensively used recreation sites would "significantly affect the quality of the human environment."

There are no clear cutting activities proposed in this project. There are mechanical thin treatments within and adjacent to recreation sites, as well as along high-use roads and trails. A mechanical thin recreation prescription is proposed at all three lodges, two of the four trailheads, three of the five campgrounds and the one picnic area. One of those campgrounds also has a mechanical thin aspen treatment proposed. The primary purpose of the mechanical thin recreation prescription is to reduce hazard trees within the sites and reduce fuels in stands adjacent to those sites. The aspen treatment includes removing conifers within and up to one and a half times the height of the tallest adjacent conifer tree to enhance. Trees over 30 inch DBH are permitted for removal as this is not a fuels reduction treatment, but meant to promote aspen on the landscape. Non-mechanical thin treatments, such as grapple or hand thin, are proposed within or adjacent to one trailhead, two campgrounds, one boat ramp, and one staging area. The primary purpose of these treatments is to cut trees less than 11 inches, pile and burn them for fuels reduction. One trailhead has hand thin treatment proposed a within 230 feet and aspen mechanical thin treatments within approximately 380 feet. There are mechanical thin treatments proposed along 6.3 miles of the 35.6 miles of non-motorized trails, along 0.1 miles of the 4.3 miles of motorized trails, and along 6.7 of the 24.1 miles of Forest System roads. These mechanical thin treatments include variable density thin, aspen prescription and recreation prescriptions. The variable density thin prescription includes removing conifers up to 30 inches, retaining variable age and size classes of trees, and increasing vertical and horizontal diversity through a mixture of clumps and openings for forest health and fuels reduction. All prescriptions around recreation sites, trails, and scenic travel corridors have design features, mitigations and standard management requirements to protect the recreation resources and visual quality of the recreation area. These include, but are not limited to flush cutting stumps, maintaining screening, chipping wood material instead of piling and burning material, and locating landing and skid trails so as to maintain a VQO of retention or partial retention. Because of the short-term disturbance to recreation activities and scenery that can be mitigated through implementing design features and standard management requirements, and the long-term benefits of improved visual quality, improved forest health, and reduction of hazard trees there was no finding of significant impacts to the quality of the human environment. Refer to the Lakes Basin Project Recreation Opportunity and Visual Quality Report for a more in-depth effects analysis discussion.

The second comment was that the proposed activities would significantly affect the Sierra Nevada Yellow Legged Frog (SNYLF), a federally endangered species under the Endangered Species Act. The Federally endangered Sierra Nevada yellow-legged frog and designated Critical Habitat occur within the Lakes Basin Project area. The Plumas National Forest portion (8,297 acres) of the Gold Lake Critical Habitat Unit (15,294 acres) is 1.4 percent of the total Critical Habitat (CH) acres for the Sierra Nevada yellow-legged frog (SNYLF) and 12 percent of the total designated CH for the SNYLF on the Plumas National Forest. 7,108 acres are within the planning area for the Lakes Basin Project. Table 87 below summarizes the number of acres affected by treatment activities.

Table 87. Summary of SNYLF Suitable Habitat acres affected by treatment activities

Treatment Type	Maximum Total Suitable Habitat Affected (Acres)	Suitable Habitat Within Designated Critical Habitat Affected (Acres)	Designated Critical Habitat Affected (Acres)
Hand Thin within SNYLF	301	206	206
Underburn Only	339	339	2,404
All other treatments	0	0	814
Totals	640	545	3,424

Perennial and intermittent creeks, springs and wet meadows (suitable habitat) are managed as Riparian Conservation Areas (RCAs) (USDA 2004). All RCAs within the project area would be managed consistent with the SNFPA ROD's riparian conservation objectives (RCOs) and associated standard and guidelines (USDA 2004). All applicable Standards and Guidelines (S&Gs), Best Management Practices (BMPs), Project Standard Management Requirements (SMRs) (Appendix D), and design elements (Table 5, 6 and 7) would be implemented with all land disturbing activities proposed in either Alternative 1 or Alternative 2 to reduce the potential for impacts to occur to individual frogs and their habitat.

Project specific consultation has been initiated for the SNYLF and Critical Habitat (September 2017) through the United States Fish and Wildlife Service (USFWS). Once the listing determination of the species was made in April of 2014, formal consultation requirements were initiated. USFS Region 5 worked closely with USFWS to develop a programmatic Biological Assessment (BA) to include affirmative Forest Service actions that may affect these amphibians or their habitat. The programmatic BA analyzed potential effects to the species and its habitat based on Standards and Guides in current Forest Plan direction for the nine National Forests within Region 5, as amended by the Sierra Nevada Forest Plan Amendment, as well as R5 Hydrologic Best Management Practices (USDA 2014). Effects of National Forest System

management actions were analyzed for approximately 10,000 projects over an area in excess of nine million acres across nine National Forests in the Sierra Nevada of California.

A second programmatic consultation for final designation of Critical Habitat has been initiated, with a programmatic BA written and submitted to USFWS in June 2017. This programmatic BA analyzed the effects to the designated critical habitat of the three listed amphibians similar to the analysis done for the individual species. The Lakes Basin Project is included in the analysis for both programmatic BAs and therefore the consultation requirement has been met. The BA portion of the Lakes Basin Project analysis tiers to both programmatic BAs. Once consultation is completed, it will be determined if the Project can proceed as planned, proceed with modifications, or require additional mitigations.

There are no additional federally listed or proposed species, critical or proposed critical habitat that would be affected by this Project. Therefore, this project complies with existing laws for protecting species, and there are no significant impacts that have been identified at this time that would require the preparation of an EIS.

Issue - Obliterate all non-system roads and construct no new roads

One commenter supports the obliteration of roads and expressed concerns that there is significant route proliferation off the Gold Lake to Summit Lake route, 12M01, and that it has long been an issue on the hill up to Summit Lake. Another commenter suggested to obliterate all temporary roads and construct no new roads. There are 24.1 miles of Forest System roads and 4.3 miles of motorized Forest System trails within the project area boundary. Under the Action Alternatives, approximately 3.6 miles of non-system routes have been identified for obliteration due to environmental concerns. No non-system routes were identified for obliteration near system trail 12M01. Approximately 1.1 miles of non-system routes would be added to system to continue to provide access to dispersed camping opportunities and existing trailheads. Those proposed to be added to the system are already existing on the landscape and are not being constructed. No new roads would be constructed to be brought into the system. Up to 5 miles of temporary roads would be constructed for access to proposed treatment units, then subsequently restored in a manner so as to prohibit motorized traffic beyond the life of the project and to restore the visual aesthetics of the landscape. The road-related work proposed within this project is in accord with the Plumas National Forest Public Motorized Travel Management Record of Decision (USDA 2010b) and the Forest Service National Best Management Practices Program (USDA 2012). The road obliteration process will utilize a number of steps to ensure roads are permanently closed. Techniques used include recontouring, subsoiling, placing impassable barriers on the road and revegetating the road to ensure the road is not reopened. Refer to the Lakes Basin Transportation Analysis Report and Lakes Basin Project Water and Soil Resource Effects Assessment for a more in-depth analysis and discussion.

Issue - Exclude treatment in aspen stands; No aspen treatment / No mechanical treatment in aspen stands

There were a few concerns raised around the use of mechanical treatment within aspen stands. One commenter suggested that mechanical treatment should be excluded from treating aspen stands because the successional replacement of aspen by conifer species is part of the natural succession of systems shaped by long fire intervals. Fire return intervals (FRIs) vary within the project area. Mean FRIs range from 5-40 years with maximum FRIs as high as 130 years. However, current FRIs have departed from historical mean averages. With continued fire suppression activities, fire frequency would continue to decrease and be outside of the natural range. Therefore, aspen stands which may have only been affected once every 130 years would foreseeably miss what may be considered an appropriate fire interval. The Proposed Action would assist in maintaining the aspen component and promote aspen at the small scale with a lack of a natural fire regime.

A second comment was that aspen stands should not be mechanically treated but should be burned, because aspen respond well to fire, such as seen in the Moonlight fire. It is true that aspen respond well to fire. In fact, results of research conducted by Krasnow and Stephens (2015) on study sites in the Lake Tahoe Basin and eastern Sierra Nevada indicate that higher severity disturbance yields higher densities of aspen sprout. High-intensity fire (as observed in the Moonlight Fire example above) yields the greatest increase in density of aspen sprouts, followed by moderate-severity wildfire and low-severity wildfire. Prescribed fire alone and conifer removal alone followed the varying intensities of wildfire in terms of increasing sprout density. Stands with no treatment or wildfires had the least sprout densities observed. Krasnow and Stephens (2015) also “found substantial evidence that greater disturbance severity yields increased aspen sprout density and growth rates, and that live conifer and/or dead aspen basal area in a stand before a fire reduces post fire sprout density.” Krasnow and Stephens proposed that two factors played a major role in determining post-fire sprout density and growth rate: 1) growing resources after fire (such as soil moisture and nutrients), which are reduced by competing vegetation, and 2) the amount of resources (live root mass and root non-structural carbohydrate reserves) that are stored below ground and protected from lethal heating during fire. As poor competitors, aspen may respond better in disturbance events that both reduce vegetative competition and release stored reproductive capacity. While a high-intensity wildfire may be the most desirable for increasing aspen sprout response and reducing vegetative competition as indicated by Krasnow and Stephens, managing a high-intensity wildfire poses the greatest risk to firefighter safety, recreation sites and values, and potentially the community of Graeagle. Applying fire in a controlled environment would pose the least threat to firefighter safety, recreation sites and values, and surrounding communities. However, while prescribed fire alone may result in a greater increase in aspen sprout density than conifer removal alone, prescribed fire may not reach a high enough intensity to reduce conifers that compete for resources and contribute seed sources. By first mechanically thinning, this would reduce the live conifer basal area that is a source of competition for resources. Then by follow-up underburning, this would reintroduce the fire disturbance component into the landscape. Earlier research by

Jones et al (2005) supports that disturbance from mechanical thinning may cause hormonal stimulation to the aspen in addition to creating the proposer growth conditions required for aspen regeneration.

Another comment was that aspen stands may be in decline due to climate change and that clearcutting mature conifer forest to release them could result in no forest at all. Clearcutting is not proposed in the Lakes Basin Project. Clearcutting generally involves the removal of all stems from within a stand. The Proposed Action would entail the removal of conifers within and adjacent to aspen clones, but would maintain aspen stems within the stand. Furthermore, as mentioned above, Jones et al (2005) found that mechanical harvesting of conifers acted as a slight disturbance mechanism (hormonal stimulation) but predominantly created the proper growth environment (sunlight) required for aspen regeneration and that four years after treatment there was an increase in aspen density compared to stands not treated. The Proposed Action is designed to maintain aspen, as a component of the ecosystem (with the exclusion of natural wildfire), for a longer period of time.

Finally, a comment was “Don't clearcut for aspen regen[eration] because it creates public opposition. Particularly important in high-use recreation area.” It is true that, in addition to being an important ecosystem component for water quality, plant diversity and wildlife, aspen stands are aesthetically pleasing locations from a recreation standpoint (Sheppard et al 2006). Thus conifer treatments within those stands has potential to create opposition from recreationists with strong ties to the area and that are opposed to the notion of clearcutting. However, as stated above, clearcutting is not proposed in the Lakes Basin Project. Conifers would be removed from aspen stands, but aspen stems would remain within the stand. Furthermore, recreation design features (Table 5), mitigations (USDA 2018f), and standard management requirements (Appendix D) have been incorporated into the project in order to reduce the short-term negative impacts of proposed treatments for the recreating public. For the aspen treatment units, these include 1) ensuring that openings created by treatments match the size, shape and pattern of existing openings in the landscape, and 2) avoiding straight lines or round openings by adding texture to the treatment edges. For aspen stands within recreation sites, these include flush cutting stumps too. For additional mitigations not specific to the proposed aspen treatment units, but for project recreation and scenery management in general, please refer to the Lakes Basin Project Recreation Opportunity and Visual Quality Report (USDA 2018f). Through the project objectives of improving aspen growing conditions and promoting aspen regeneration, the benefit of maintaining the aesthetically pleasing nature of aspen stands within the LBRA may be realized in the long-term for the enjoyment of recreationists.

Issue - No underburning / No underburning in Lakes Basin Recreation Area

One comment was that underburning is not needed in portions of the Lakes Basin Recreation Area (LBRA) because the threat of wildfire was overstated in the project area due to the terrain, north and northeast aspects, wind direction, and the lack of historic fires. A large portion of the original proposed 3,000 acre underburn only unit consists of brush with scattered rock

outcroppings, lakes, and islands of trees. The interdisciplinary team discussed that it would be difficult to burn and get the desirable vegetation consumption to create a mosaic burn. Achieving a mosaic burn would be desirable to maintain wildlife habitat. Furthermore, burning brushy areas around rock outcrops would be challenging to protect unknown sites of rock art. A decision was made to remove approximately 600 acres of the underburn only unit that contained the rockier terrain and lakes. The present 2,404 acre unit is focused on both brushy and forested areas closer to the WUI defense zones and where project objectives were more likely to be achieved.

While it was decided to reduce the overall size of the proposed underburn only unit, it also was decided not to eliminate it in its entirety. Fires today can burn with high severity on all aspects and slopes. Locally this was seen in the project area in the 1920's in the WUI area surrounding Graeagle. More recently this was witnessed on the nearby 2006 Bassetts Fire that burned high-severity patches on north and northeast slopes approximately 2.5 miles to the southeast on the Tahoe National Forest. In the area, terrain driven winds occur and are overridden by the predominant "flow" which is south-southwest per data from portable weather stations in the area, including the Denten Creek remote automated weather station located on the slopes of Penman Peak. Depending on the location, a fire has potential to be pushed in the direction of the town of Graeagle. It is true that there are portions of the LBRA that have natural barriers such as rock outcrops and lakes reducing threats of large scale wildfire. However, depending on fire start location, temperatures, wind speed and direction, a wildfire has potential to effect historic lodges and other recreation sites that are in close proximity. With prescribed fire, there is control of the conditions under which fire occurs, allowing for safer introduction of fire to the landscape. The natural barriers serve as an effective tool to help accomplish the mosaic pattern desired during prescribed fire treatments. Furthermore, under the Forest Plan, general direction for the Lakes Basin Management Area is to "use prescribed fire to preserve the wildland value" (PNF 1988, page 4-325). Prescribed fire not only has the benefit of reducing fuels where needed to meet project objectives, but it also has the benefit of preserving the wildland value that was a natural part of the LBRA prior to its creation.

Another comment was that underburning could cause damage to historic sites, have a negative impact on endangered wildlife habitat and sensitive plants, and affect historic lodges with smoke and embers. Standard protection measures for all historic and pre-historic sites and areas would be taken prior to implementation. By implementing prescribed fire at the proper time of year, smoke impacts to WUI are manageable. Structure protection/defense would be top priority during implementation. Additionally, given the location of the lodges in low lying riparian areas, the likelihood that they will even carry fire is minimal, thus "seeing" any scorch or mortality from burning is unlikely. Design features, mitigations, and SMRs are in place to protect resources. Before underburning operations start, potential areas of concern would be identified due to resource concerns such as archeology, wildlife, botany etc. Control areas that prohibit project activities would be established. Hand line could be established around large trees or other areas of concern as needed. Thinning and underburning activities are being done for forest health objectives, a benefit of these activities is improved wildlife habitat.

Given Forest Plan direction of using prescribed fire to preserve wildland value in the Lakes Basin Management Area portion of the project area, the need of prescribed fire to meet fuels related project objectives in portions of the project area (especially in the WUI defense zones), and the low risk of negative impacts due to design features, mitigations, and standard management requirements, underburning was not eliminated from either of the Action Alternatives.

Appendix F – Risk of Insect and Disease Mortality

Introduction

Forests are dynamic systems, under constant change, and influenced by both natural and cultural factors. This change affects forest structure, density, species composition, tree growth and vigor, and susceptibility to insects, disease, and wildfire. A healthy forest is resistant to, but not absent of insects and disease. Forest insects are an integral functioning component of the ecosystem. Bark beetles have the largest impacts, with sporadic outbreaks causing widespread tree mortality in virtually all major conifers and forest types (Ferrell 1996). An outbreak (synonymous with epidemic) pertains to populations of plants, animals, and viruses that build up, often rapidly, to unusually and generally injuriously high levels (Helms 1998). In recent years, bark beetles have caused significant mortality in the Sierra Nevada, rivaling mortality caused by wildfire in some locations (North 2012).

Affected Environment

Tree densities have a strong relationship to bark beetle-induced mortality. Higher density stands increase competition for resources (especially water and light) and reduce tree vigor, which makes individual trees less able to withstand insect attack. In the current absence of frequent understory fire, bark beetles have become one of the principal agents of tree mortality in California. Under historic reference conditions, frequent fire would have interacted with insects and diseases, as well as abiotic and biotic site conditions, to drive stand structure. Much more open and heterogeneous forest structure resulted, and-based on the strongly inverse stand density versus bark beetle relationship-it can be inferred that bark beetle-caused mortality was probably lower then under current conditions (Safford and Stevens 2017).

California has been facing unprecedented tree mortality in recent years and recently experienced four years of the driest conditions in recorded history (fall 2011 through fall 2015, PPIC 2018). These drought conditions combined with the increased infestation of native bark beetles contributed to the death of over 129 million of trees on federal, state, and private lands across California during the past 10 years. Furthermore, the extended drought weakened trees and left millions of acres of forestland highly susceptible to insect attacks. The drought stress is exacerbated in forests with too many trees competing for limited resources, especially water. Tree losses due to drought stress and bark beetle attacks are expected to increase until precipitation pattern levels return to normal or above normal for one to multiple years (CA 2018). Between 2012 and 2017, the project area drought classification ranged from “Abnormally Dry” to “Moderate”, “Severe”, and “Extreme” and “Exceptional” drought stages (USDA 2017).

On October 30, 2015 Governor Brown issued an emergency proclamation and established the California Tree Mortality Task Force (TMTF). And on September 1, 2017 Governor Brown issued Executive Order B-42-17 to bolster the state’s response to the unprecedented die-off. One goal of the task force was to identify and map areas of tree mortality caused by 5 years of drought that pose the greatest potential of harm to people, property, and natural resources. These areas, known as High Hazard Zones (HHZs), are the areas prioritized for tree removal. These HHZs are

represented in two tiers, representing both potential direct threat to people, buildings and infrastructure from falling trees (Tier 1), as well as broader fire risk and forest health considerations (Tier 2) (Figure 19. , FRAP 2018). The location of the Tier 1 and Tier 2 HHZ relative to the Lakes Basin Project Area is shown in Figure 20.

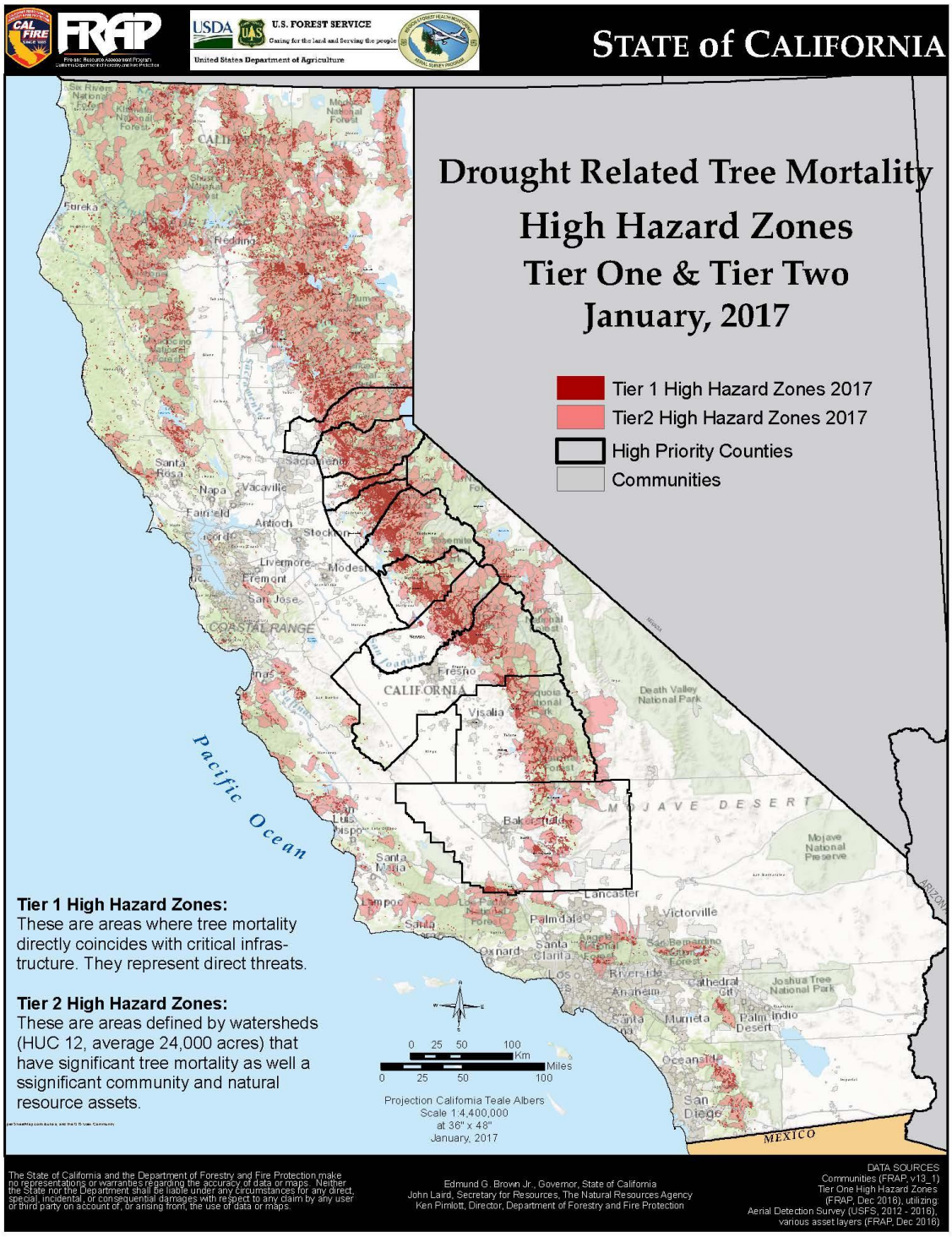

Figure 19. Drought-Related Tree Mortality High Hazard Zones within California.

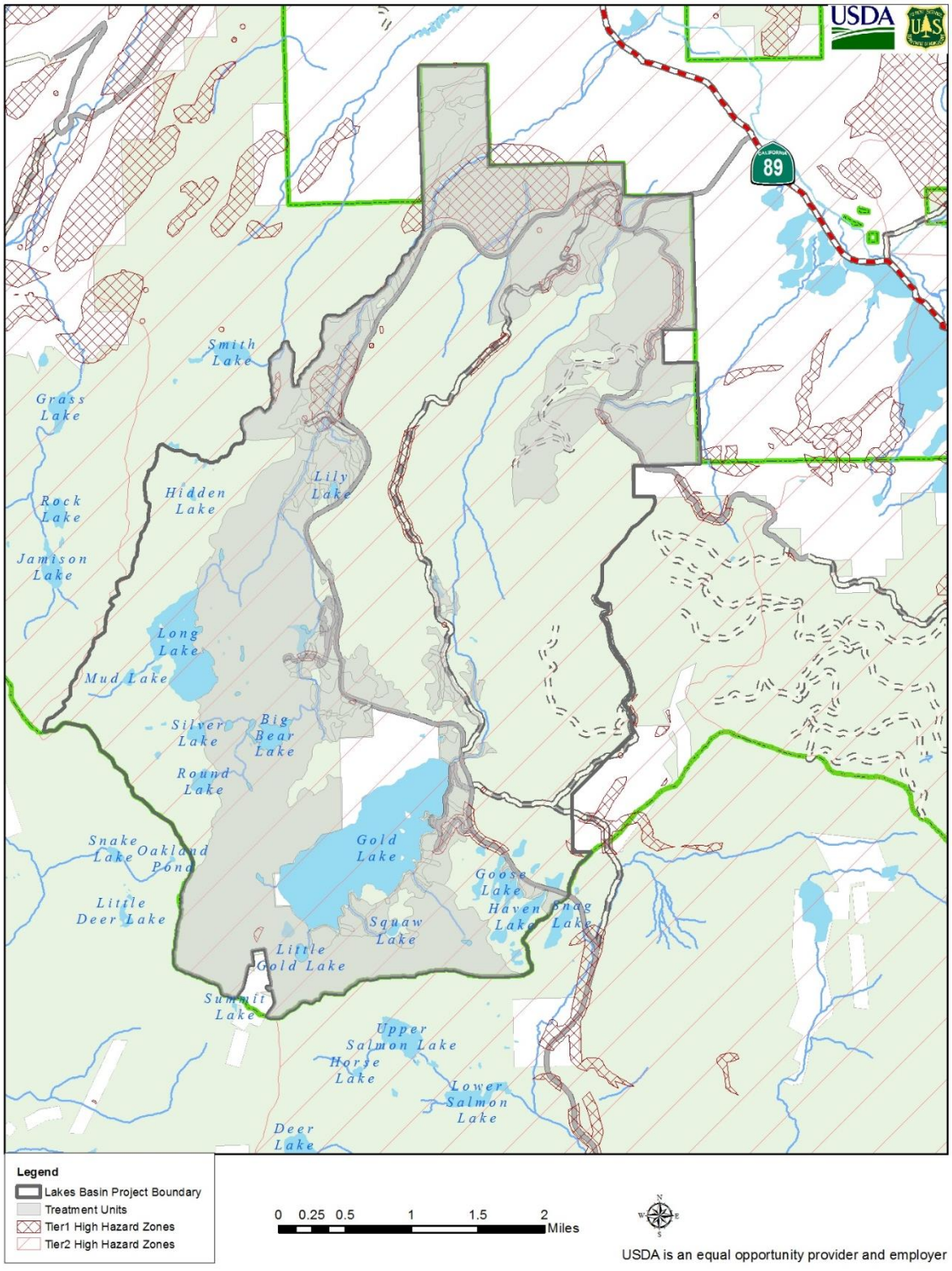

Figure 20. Tier 1 and Tier 2 High Hazard Zones within Lakes Basin Project Area

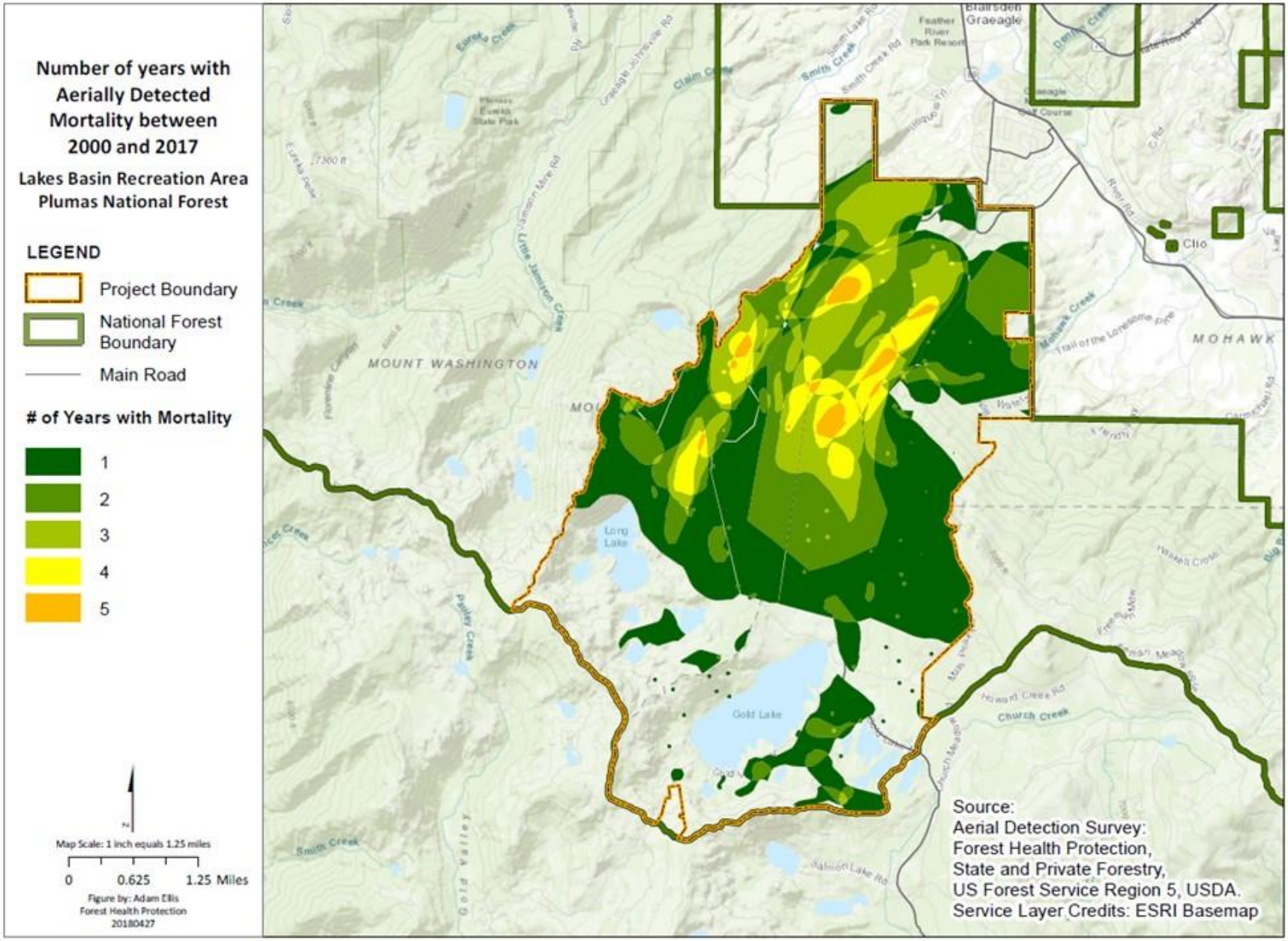

Figure 21. Aerially detected mortality between 2000 and 2017 in the Lakes Basin Project Area (Ellis 2018).

Existing Condition

The Lakes Basin project area encompasses several watersheds designated as Tier 2 HHZs. Additionally, approximately 763 acres within the project area has been designated as Tier 1 HHZs (Figure 20.). Tier 1 HHZs are generally correlated with areas that have experienced three or more years of mortality as shown in Figure 21. . Figure 21. displays the number of years with aerially detected mortality within the Lakes Basin project area and is based on United States Forest Service (USFS) Region 5 annual Aerial Detection Surveys (ADS) for the years 2000 through 2017. During this period, a large majority of the project area had mapped mortality areas above background mortality levels. Figure 21. therefore shows the cumulative effect of ongoing tree mortality in the project area. Aerial detection surveys collect data on current year tree mortality and damage. Data includes damage type, number of trees affected, and affected tree species. The primary agent of tree mortality is the fir engraver (*Scolytus ventralis*) with lesser amounts of mountain pine beetle (*Dendroctonus ponderosae*) and Jeffrey pine beetle (*Dendroctonus jeffreyi*) caused mortality. The Lakes Basin project area, since 2002, has experienced years where higher than normal populations of forest pests have caused elevated tree mortality (Figure 22.). In the Lakes Basin Area in 2016, “attacked trees were generally the largest individuals (Jeffrey Pine) that were competing with white fir” (California Forest Pest Council 2016). These large Jeffrey Pines in the Recreation area have high ecosystem value and high scenic value. In 2017, aerial detection surveys indicated approximately 7,427 trees killed due to bark beetles across more than 1,700 acres (14 percent) of the project area.

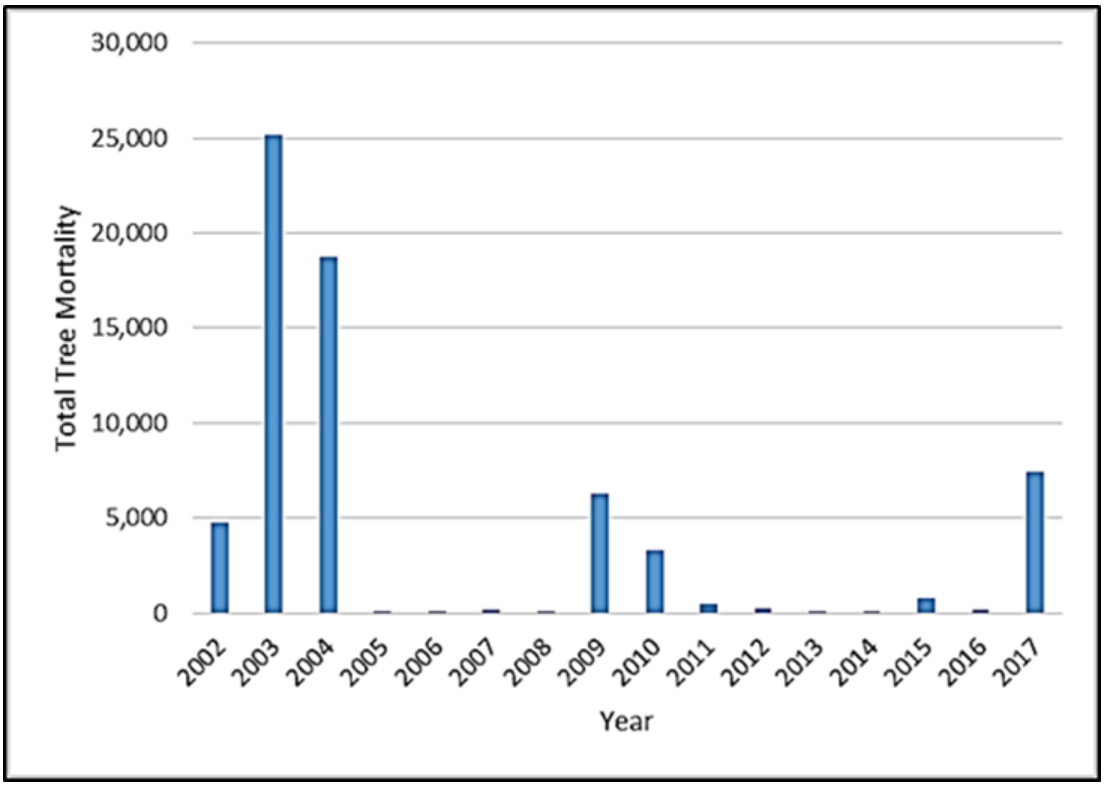

Figure 22. Annual tree mortality within the Lakes Basin project area (Data Source: USFS Aerially Detected Mortality maps 2002 through 2017).

Currently, high stand densities are prevalent within the project area, as described under "Existing Conditions" of the Lakes Basin Vegetation Report. On average, within mixed conifer stands, there are approximately 586 TPA, 236 square feet per acre of basal area, and an average relative density of 66 percent. These overly dense forest stands are an important cause of tree susceptibility to insects and pathogens. Intense tree-to-tree competition in overly dense stands tends to slow growth and decrease resistance of trees. Spread of insects, disease, and fire is also enhanced in dense stands. Overly dense stands are a major cause of tree mortality in the Sierra Nevada forests during both drought and non-drought periods (Ferrell 1996). In dense stands, changing climatic conditions could significantly alter the amount and distribution of bark beetle-caused mortality in the Sierra Nevada (North 2012). Also, Battles et al (2008) evaluated the impacts of climate change on the mixed conifer region in California and provided insight to forest health concerns and management implications for forest managers. This study found that changes in climate could "exacerbate forest health concerns" by increasing weakened tree susceptibility to mortality as a result of fire, disease epidemics and insect outbreaks and potentially enabling forest insects and disease to expand ranges or increase potential for widespread damage. With high stand densities in the project area and climatic uncertainty the potential exists for insect populations to remain above normal levels, spread, and cause significant loss of recreation values and negatively affect adjacent resources.

References Cited in Appendix F

Battles, J.J., T. Robards, A. Das, K. Waring, J.K. Gilless, and G Biging. 2008. Climate change impacts on forest growth and tree mortality: a data-driven modeling study in the mixed conifer forest of the Sierra Nevada, California. Climate Change 87 (Supplement 1):S193-S213.

California Forest Pest Council. 2016. California forest pest conditions report. Page 7.

Ellis, A. 2018. Map showing number of years with aerially detected mortality within the Lakes Basin project area between 2000 and 2017. USDA Forest Health Protection Pacific Southwest Region Northeastern California Shared Service Area.

Ferrell, G. T. 1996. The influence of insect pests and pathogens on Sierra forests. Volume II. Assessments and Scientific Basis for Management Options. Davis, University of California Wildland Resources Center Report No. 45.

FRAP 2018. Fire and Resource Assessment Program (FRAP) webpage. State of California, California Department of Forestry and Fire Protection. http://frap.fire.ca.gov/projects/projects_drought

PPIC 2018. California's Latest Drought. Public Policy Institute of California. Accessed online at: http://www.ppic.org/publication/californias-latest-drought/

USDA 2017. Drought and tree mortality in the Pacific Southwest Region. Lessons learned from extreme drought and tree mortality in the Sierra Nevada: How can past events inform our approach forward? USDA Climate Hub, Sacramento, CA.

Appendix G – Forest Plan Direction

Consistency with the Forest Plan

Plumas National Forest Land and Resource Management Plan (PNF LRMP) prescriptions for the Lakes Basin Recreation Area include Recreation Area (Rx-5) and Semi-Primitive Area (Rx-8) prescriptions (Table 88). In the Lakes Basin Recreation Area, the forest plan directs to "Control insect and disease epidemic only if significant resources outside the area are threatened or an unnatural, significant loss of recreation value will occur." (USDA 1988a, pages 4-82, 4-90).

As discussed above and shown in Figures 18 and 19, the project area falls within the Tier 2 High Hazard Zones as designated by the State of California's Tree Mortality task force. These Tier 2 High Hazard zones are watersheds that have significant tree mortality as well as significant community and natural resource assets. In addition, 763 acres within the project area has been designated as Tier 1 High Hazard Zones where tree mortality directly coincides with critical infrastructure representing direct threats. Map 6 displays where these site-specific Tier 1 High Hazard zones are within proximity and/or directly overlay with project treatment units.

Where adjacent resources are threatened, the PNF LRMP directs to use a site specific, integrated pest management approach to control forest pests including employing mechanical and cultural methods based on effectiveness, cost-efficiency and protection of human health and environmental Quality (USDA 1988a, 4-11), and that the options to control this damage will be evaluated and integrated into project activities (USDA 1988b, 4-81). For the species displaying outbreak activity in the project area (*Dendroctonus* and *Scolytus* species) the best opportunity to mitigate bark beetle-related damage is through managing vegetation to promote healthy stands and implementing measures to reduce diseases (USDA 1988b, H-2,H-3). Site-specific project level prescriptions are developed to be consistent with forest plan direction and will reduce stand densities to reduce vulnerability to spread of bark beetle mortality within the Lakes Basin Recreation Area. For example prescriptions will maintain and promote large diameter Jeffrey pine while reducing stand densities of competing white fir.

Table 88. Prescriptions and management area relevant for the Lakes Basin Recreation Area based on the Forest Plan (USDA 1988a)

	General Direction	Standards and Guidelines
Lakes Basin Recreation Area - Rx5		
Timber (4-81)	To protect recreation values, generally harvest no timber from the Lakes Basin Recreation Area.	Harvest no timber, except as allowed under Pest Management Standards and Guidelines.
Forest Pests (4-82)	In the Lakes Basin Recreation Area, rely on natural processes where adjacent resources are not threatened	Control insect and disease epidemic only if significant resources outside the area are threatened, or an unnatural, significant loss of recreation value will occur
Semi-Primitive Area - Rx8		
Timber (4-89)	To protect semi-primitive recreation values, use appropriate special cutting methods	Harvest timber only for salvage purposes, to remove safety hazards, or if visual experiences are enhanced. Obtain approval of the Forest Supervisor for any timber harvest. Construct only temporary roads if needed for salvage operations.
Forest Pests (4-90)	Rely on natural processes where adjacent resources are not threatened	Control insect and disease epidemic only if significant resources outside the area are threatened, or an unnatural, significant loss of semi-primitive character will occur
Management Area 35 – Lakes Basin		
Timber (4-324)	To protect recreation values, use appropriate special cutting methods	Harvest timber only for salvage purposes, to remove safety hazards, to construct or improve recreation, or if visual experiences are enhanced.